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THIS PROCEDURAL WORKBOOK WAS DEVELOPED FOR USE IN AN EXPERIMENTAL STUDY. APPROXIMATELY 1,100 PROCEDURAL STEPS PRESENT DETAILED INSTRUCTIONS TO FOLLOW IN BUILDING A FOUR-TUBE RADIO RECEIVER KIT WHICH USED A PRINTED CIRCUIT BOARD. THE TEST WHICH ACCOMPANIES THIS WORKBOOK HAS THE ACCESSION NUMBER ED 003 215. (JM)

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AMERICAN INSTITUTE FOR RESEARCH

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ELEMENTARY ELECTRONICS LABORATORY

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The development of these materials was supported by Grant No. 736022 from the United States Office of Education, Department of Health, Education and Welfare, under Title VII of the National Defense Education Act of 1958. These auto-instructional materials were developed at the American Institute for Research by Dr. William A. Deterline and Dr. David J. Klaus. Dr. Karl S. Quisenberry of the Department of Physics, University of Pittsburgh (now with Knolls Atomic Power Laboratory, Schenectady, New York) served as technical consultant. Dr. Arthur A. Lumsdaine was principal investigator.

These materials were prepared for use in an experimental study of the auto-instructional approach in education. Further information concerning the design of the study and the resulting data are contained in reports available from the American Institute for Research.

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DESCRIPTION OF MATERIALS

With these instructions the following items were supplied to the students:

Radio kit: 4 tube, superheterodyne receiver kit, manufactured by Seico Co., distributed by General Merchandise Company, Milwaukee 1, Wisconsin, stock number 32-3642A. List price, $9.99. The kit included parts indicated on circuit diagram (last page of this booklet), plastic case with rod antenna and 3-1/2" speaker pre-mounted, and a printed circuit board with off-on volume control and variable tuner capacitor pre-mounted to the board.

Soldering iron: 85 watts, wedge tip, 8-1/3" long including wooden handle, 5 ft. cord. Metal stand included. Distributed by Olson Electronics, 260 S. Forge St., Akron 8, Ohio, stock number TL-119. List price, $.99.

Diagonal cutter: 6", distributed by Olson Electronics, 260 S. Forge St., Akron 8, Ohio, stock number TL-7. List price, $.99.

Screw driver: 4" w/plastic handle, distributed by Olson Electronics, 260 S. Forge St., Akron 8, Ohio, stock number TL-221. List price, $.15.

Solder: 40/60 alloy, energized rosin core, .062" diameter, 3 feet per student.

Multitester, voltohm meter: 6000 ohms per volt, w/test leads, distributed by Olson Electronics, 260 S. Forge St., Akron 8, Ohio, stock number TE-137. List price, $12.81.

Steel wool: 1" square piece.

Parts Sheet: 8-1/2" x 11" sheet for layout of all components.

Paper clips: 8 for practice soldering.

Name ______________________

Grade ______________ Age ______

School ______________________

DIRECTIONS FOR USING THIS BOOKLET

DO NOT OPEN THE YELLOW BOX UNTIL YOU ARE TOLD TO DO SO.

This booklet contains all of the detailed instructions that you are to follow in building the radio from the kit that has been given to you. You will find that the instructions consist of short items that you are to read and follow one at a time. Read an item all the way through before you do anything, then, after reading the item, do what it tells you to do and then put a check mark (✓) in the small circle beside the item. Do not do anything more than an item tells you to do, not even when you think you know what comes next. Do exactly what you are told to do, and never do anything unless you are told to do so. Take your time, and do not hurry.

If you follow the instructions exactly, the finished radio will work, but if you do not carefully follow the instructions, the radio probably will not work at all.

You will be using a soldering iron to put the radio together, and the metal parts of the soldering iron get very hot. If you are careful and use the soldering iron exactly the way you are told to use it you will not get burned, and you will do a good soldering job.

You will use a special kind of test meter to test your radio; you must follow the directions exactly to avoid ruining the meter, and in order to obtain the correct measurements.

Remember:

Read carefully.

Follow the directions.

Read an item carefully and be sure that you understand it and then do exactly what the item tells you to do.

Never do anything except what the instructions tell you to do.

Don't hurry.

INSTRUCTIONS ON PUTTING THE KIT AWAY WHEN YOU STOP

Follow these instructions only when putting the kit away at the end of a unit.

If you were using the soldering iron, be sure it is unplugged and put it aside to cool.

Take everything out of the yellow box that is in it now.

Put the radio cabinet in the yellow box face down, with the open back up in the air.

Take all parts except the white boxes containing glass tubes off of the Parts Sheet and gently put them into the radio cabinet. Be careful not to drop the small square piece of metal out of the hole in the tuner dial.

Put the solder and the screw driver into the radio cabinet with the other parts.

Put the tube boxes gently on top of the parts in the yellow box.

Put the circuit board gently on top of the tube boxes.

Put the brown back of the radio into the yellow box edge first, with the metal flap on top, beside the radio cabinet against the side of the yellow box.

Hold your hand about an inch or a half inch from the tip of the soldering iron and see if it is cool yet. If it is not, wait awhile longer until it is completely cool. If it is cool, put the metal stand into the yellow box, and then put the soldering iron into the yellow box beside the radio cabinet.

Tuck the cord of the soldering iron into the yellow box.

Fold the Parts Sheet once and tuck it into the yellow box beside the brown back of the radio.

Check the table to see that you have put everything except the wire cutters and meter into the yellow box, then put the yellow box away until next time. Put the yellow box on top of this booklet.

RADIO CONSTRUCTION JOB INSTRUCTION

READ EACH ITEM COMPLETELY, ALL THE WAY TO THE END OF THAT ITEM, AND THEN DO EVERYTHING THE ITEM TELLS YOU TO DO.

RADIO UNIT A

1. Open the large yellow box and remove only the one large sheet of paper. ☐

2. Unfold the sheet, which is labeled Parts Sheet at the top; smooth it out and lay it on the table off to your left and away from the edge of the table.

☐

3. Lift the cardboard frame that is at the top of the box out of the box without lifting out the radio that is beneath it. Hold the radio down in the box with one hand. ☐

4. Lay the cardboard frame on the table and remove the blue envelope and the soldering iron and metal stand that are inside the cardboard frame, and lay them on the table.

☐

5. Throw away the cardboard frame. ☐

6. Remove the radio from the yellow box and put it on top of the Parts Sheet. ☐

7. Remove the other cardboard frame from the bottom of the box and throw it away. ☐

8. Put the soldering iron and the blue paper bag back into the yellow box. ☐

9. Put the yellow box out of your way, and pick up the radio and put it in front of you again. ☐

10. Rip off the plastic wrapper from the radio and discard both the small piece of brown paper and the plastic wrapper. ☐

11. Lay the radio on its back with both black knobs up in the air and the legs facing you.

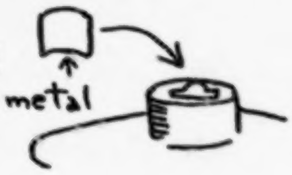
☐

12.. Hold the radio against the table firmly with one hand. With the other hand pull up steadily on the small black knob until it comes completely off the radio. ☐

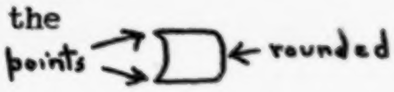
13. Find the circle on the Parts Sheet labeled "Small Knob." Put the knob on that circle, upside down. ☐

14. Hold the radio firmly again and pull off the large round Tuning Dial Knob. ☐

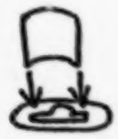
15. There is a small square piece of metal inside the hole in the end of the Tuning Dial. If it fell out, pick it up and hold it in your other hand. If it did not fall out, shake it out into your other hand. ☐



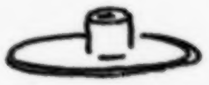
16. Look at the piece of metal closely and see that it is slightly rounded on one side, with two points on the opposite side. ☐



17. Now put the small piece of metal back into the slot in the end of the Tuning Dial. Put the two points into the slot first and push the piece of metal all the way in. ☐

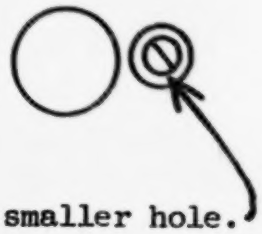


18. Hold the shaft of the Tuning Dial pointing up in the air. Look on the Parts Sheet for the large circle labeled "Tuning Dial" and lay the Tuning Dial in that circle. ☐



19. Take the small blue paper bag out of the yellow box, open it and remove only the screw driver. Put the bag back into the yellow box. ☐

20. Looking down at the face of the radio, find the two holes which are covered by the tuning knob, and which look like this: ☐



21. Look for the screw with a slot in it at the bottom of the smaller hole. ☐

22. Use the screw driver to loosen the screw until the screw wobbles and can be pushed over by the screw driver. Turn the screw 4 or 5 turns to the left, counter-clockwise ↶ to loosen it. ☐

23. Holding one hand over the screw hole to catch the screw, pick up the radio with the other hand and turn the entire radio over. Catch the screw as it falls out. ☐

24. Put the radio back on the table, face down and with the legs toward you. ☐

25. Find the small circle on the Parts Sheet marked "screw." Place the screw in that circle. ☐

26. Put the screw driver back into the yellow box. Do not put it back into the paper bag. ☐

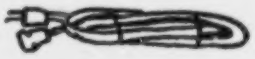
27. On each side of the back is a round grey knob with the word SEICO printed on it. Turn these knobs several turns counter clockwise, ↺ , and remove them. ☐

28. Put the two grey knobs onto the two small circles labeled "SEICO" at the bottom of the Parts Sheet. ☐

29. Lift off the brown back of the radio and put it into the yellow box, and then check the position of the radio so that the legs are toward you and the open back is up in the air.

☐

30. On top of the parts which are stacked in the radio case is a large, coiled brown wire with a plug on each end. Remove it and put it in the yellow box. Do not remove the rubber bands from the wire.



☐

31. Near the bottom of the radio there is a tan circuit board that slides into the cabinet. Locate it but do not remove it.

☐

32. Between the circuit board and the bottom of the radio is wedged a small white box. Remove it.

☐

33. Open the white box you have just removed and carefully take out the small metal can. Put the empty white box into the large yellow box. ☐

34. Notice that printed on the can are the numbers 40, 20 and 5. Look for the place on the Parts Sheet that says "Small Metal Can" and put the can there. ☐

35. In the larger space between the brown circuit board and the top of the radio are 4 more white boxes. CAUTION: THESE WHITE BOXES CONTAIN GLASS RADIO TUBES. Remove any one of the white tube boxes and hold it carefully, but do not open it. ☐

36. Look for a number printed on one end of the box. Check here which of the numbers is printed on the box:

12AU6 ☐ 12AV6 ☐ 35W4 ☐ 50C5 ☐

37. Look for the place on the Parts Sheet that has the same number as the tube box you are holding. Do not open the box. Put the box on that spot. ☐

38. Now take a second tube box out of the radio case and handle it carefully. Find the number on it and put a check beside the number in Item 36 as you did before. ☐

39. Find the place on the Parts Sheet for this tube. Carefully put the tube box on the Parts Sheet. ☐

40. Carefully remove the third tube box, find the number and check it in Item 36. Put the box on the correct place on the Parts Sheet. ☐

41. Carefully remove the last tube box from the radio case, find its number, check the number in Item 36. Find the correct place on the Parts Sheet and put the tube box on the Parts Sheet. ☐

42. Remaining in the large space where the tube boxes were is one other object, which is wrapped in heavy white paper. Remove this package carefully. ☐

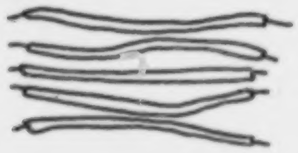
43. Unwrap the paper from around the large metal can, and discard the paper and plastic wrappers. Be careful not to turn the screw at each end of the can. ☐

44. This large metal can contains the IF Transformer. Find the place on the Parts Sheet that says IF Transformer and put the can on that spot. ☐

45. Between the circuit board and the bottom of the radio there are two plastic bags. Remove them carefully and place them in front of you on the table, beside the radio case. ☐

46. One plastic bag contains some colored wires. Put the other bag aside. Carefully take everything out of the bag containing the colored wires and put the items on the table before you. Discard the empty bag. ☐

47. There are five colored wires. They are bent in half; straighten them out with your hands and put them back on the table. ☐



48. Look on the Parts Sheet and find the place marked "Five Colored Wires." ☐

49. Check each wire here, and put them all on the Parts Sheet in the place you just looked at.

red wire ☐ white wire ☐ green wire ☐ blue wire ☐ black wire ☐

50. Remaining on the table is a round tube-like coil and a thin brown block with 7 wires sticking out of it. Pick up the thin brown block. ☐

51. The brown block has CR 150 printed on it. Place the block on the Parts Sheet on the spot marked CR 150. ☐

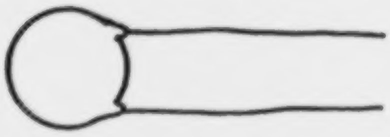
52. Now pick up the round tube-like coil, holding it here: Place the coil carefully on the Parts Sheet on the place marked OSC Coil. ☐

53. Carefully remove the parts from the second plastic bag and place them on the table before you. Discard the bag. ☐

54. There are four sockets, each with 7 metal prongs. Count the sockets. ☐

55. The one socket that looks a bit different from the others goes to the right of the other three sockets on the Parts Sheet. Put the four sockets on the Parts Sheet on the circles drawn for them. ☐

56. There are three green wafers with two wires sticking out of each wafer. Count the wafers.



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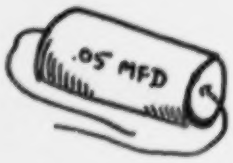
57. The green wafers are capacitors. The largest in size says .01 uFP on it. Find the portion of the Parts Sheet that says "Capacitors" and put the largest capacitor on the largest circle which also says .01 uFP. ☐

58. The next largest green capacitor also says .01 uFP on it. Put it on the Parts Sheet on the circle drawn the same size as the capacitor. ☐

59. The smallest green capacitor has 50 PF printed on it. Place it on the Parts Sheet on the circle that is the same size as the 50 PF capacitor. ☐

60. Pick up the white cylinder with the metal ends and a wire sticking out of each end. This is another type of capacitor. Read the printing on it. It says .05 MFD.



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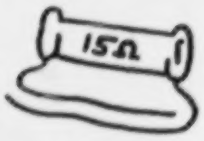
61. On the Parts Sheet beside the green capacitors there is a sketch of the capacitor you are holding, and on the sketch is printed .05 MFD. Do not straighten the wires by unbending them. Put the capacitor on the sketch. ☐

62. Now pick up the grey object that looks like this: Printed on it is "15Ω" which identifies it as a resistor.



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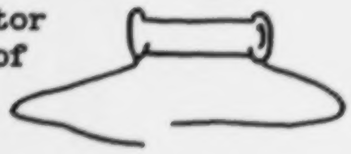
63. With your hands bend the two wires of this resistor until the wires look like this, but so the tips of the wires do not touch each other.



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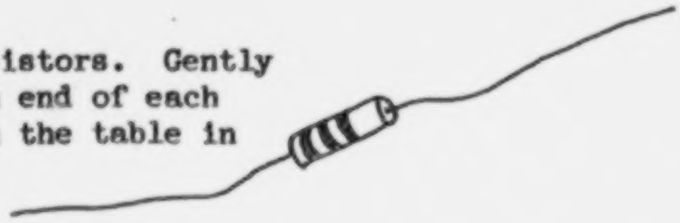
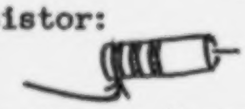
64. On the Parts Sheet there is a portion marked "Resistors." Find the sketch of this resistor and put the resistor on that spot. Do not straighten the wires by unbending them. ☐

65. The remaining three objects are also resistors. Gently straighten the wires that come from each end of each resistor and put the 3 resistors back on the table in front of you. ○



66. Pick up any one of the three resistors and look at it closely. There are three colored stripes around each resistor. ○

67. The three resistors each have different colors of stripes. Look at the resistor you are holding and check here which one you have in your hand. Starting with stripe at the edge of the resistor:



red - red - green ○

brown - green - brown ○

green - blue - red ○

68. On the Parts Sheet in the portion marked "Resistors," there are drawings of three resistors, and beside each drawing the colors are listed. Find the place where the colors listed match the resistor in your hand. Put the resistor on that spot. ○

69. Pick up the second resistor, look at the colored stripes and check the corresponding circle in Item 67. ○

70. Find the place on the Parts Sheet where this resistor's colored stripes are printed. Put the resistor on that spot. ○

71. Pick up the last resistor; look at the colored stripes and check the corresponding circle in Item 67. ○

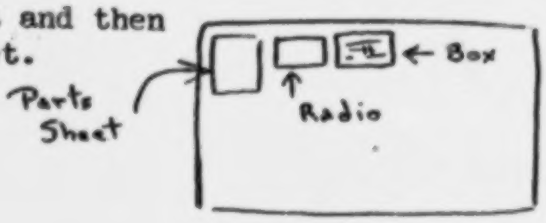
72. Find the place on the Parts Sheet where this resistor belongs. Put the resistor on that spot. ○

73. Look at the Parts Sheet. Be sure that every place that should have an item on it has the correct item. Count the number of items, and see that there are 30 of them. ○

74. Now look at all the parts and put a check in the circle when you have located each part. You should have:

- 4 radio tubes ○
- 3 small resistors ○
- 1 large grey resistor ○
- 1 small knob ○
- 1 large tuning knob ○
- 1 screw ○
- 1 OSC coil ○
- 1 CR 150 tan block ○
- 2 grey SEICO knobs ○
- 5 colored wires ○
- 4 sockets ○
- 3 green wafer capacitors ○
- 1 white capacitor ○
- 1 small metal can ○
- 1 IF Transformer ○

75. Put the radio cabinet beside the Parts Sheet and then place the yellow box beside the radio cabinet. ☐



76. You are now going to check some of the components by using a meter. Go get a voltmeter and its two wires, which are called leads. Set the Voltmeter and its two leads in front of you on the table. ☐

77. Plug the short end of the red lead into the hole marked +. Push it all the way into the hole. ☐

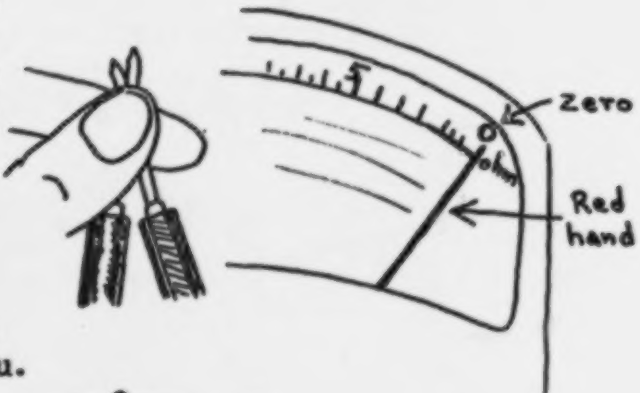
78. Plug the short end of the black lead into the hole marked -. ☐

79. Look at the number written on the round meter dial and find where it has printed on it $\overset{RX10}{\Omega}$. ☐

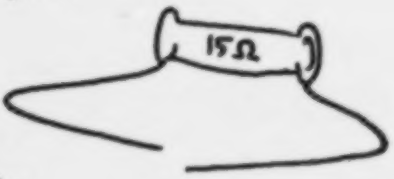
80. Set the meter dial to $\overset{RX10}{\Omega}$ by turning the dial until $\overset{RX10}{\Omega}$ is directly under the white triangle pointer of the meter. ☐

81. Touch the tips of both leads together. The red hand of the meter will swing all the way from the left to the right. ☐

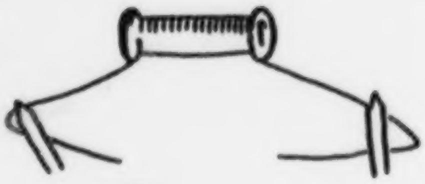
82. Hold the tips of the leads together with one hand and with the other hand turn the black button in the lower right hand corner of the meter slightly back and forth until you have adjusted the red hand to point exactly at 0 (zero) on the top black ohm scale. The zero of the ohm scale is in the upper right hand corner of the scale window. ☐



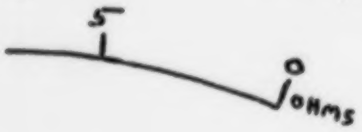
83. Take the grey 15 ohm resistor from the Parts Sheet and lay it on the table in front of you. ☐



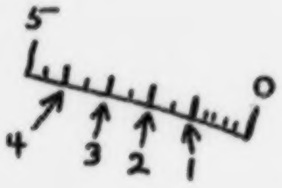
84. Hold one meter lead in each hand, touching only the red and black plastic handles. Touch one lead to each of the wires from the 15 ohm resistor. (It doesn't make any difference which lead is on which side.) ☐



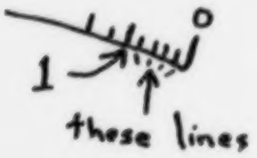
85. Look at the black ohm scale which is at the very top of the meter scale; the red hand is between the zero and the number 5. Now lay the leads on the table beside the resistor. ☐



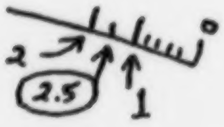
86. Look closely at the small black vertical lines on the ohm scale. The 0 is on the right. Between the 0 and the 5 there are 4 vertical lines indicating 1, 2, 3 and 4; look closely and see that they are the longest of the vertical lines. ☐



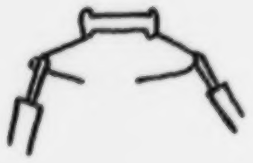
87. Look at the tall vertical line that represents the number 1. Between 0 and 1 there are 4 smaller lines. Be sure you have found the four short lines between 0 and 1. ☐



88. Now look at the longer lines that represent 1, 2, 3 and 4. Between 1 and 2 is a short line representing 1-1/2, or 1.5. Look at the short lines that represent 2.5, 3.5 and 4.5. ☐



89. Now pick up one meter lead in each hand again. Touch one lead to each end of the grey resistor which is lying on the table. Continue to hold the tips of the leads against the resistor wires and look at the ohm scale and at the red meter hand. The red hand points very close to one of the small black lines between 0 and 5. Figure out what number the small lines represents, then lay the leads on the table beside the resistor. ☐

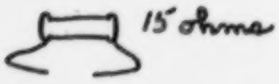


90. Write the number represented by the small black line here: ___________. ☐

91. You should have written 1.5 in Item 90. If you did, go on to the next item. If you did not, go back to Item 86 and repeat the last five items. ☐

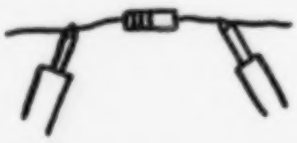
92. The meter is set at $\overset{RX10}{\Omega}$. The RX10 means "R times 10," and R means the Reading on the scale. Your reading was 1.5, so multiply 1.5 by 10 and write the product here: ______________. ☐

93. You measured the resistance of this resistor to be 15 ohms, which is also printed on the resistor. Put the 15 ohm resistor back onto its correct position on the Parts Sheet, and write "15 ohms" on the Parts Sheet right beside the 15 ohm resistor. ☐



94. Now pick up the small resistor that has the light brown - green - light brown stripes on it. Look carefully at the resistor and be sure that on the brown resistor the three colored stripes are light brown - green - light brown. ○

95. Lay the resistor you are holding down on the table. Pick up one lead in each hand and touch one lead to each of the two wires coming from the resistor. Be sure your fingers are not touching either the wires from the resistor or the metal tips of the leads. ○



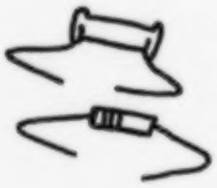
96. Read the meter on the ohm scale carefully. The red hand is at the heavier black line about halfway between 10 and 20, so the reading is approximately 15. The small black lines between 15 and 20 represents 16, 17, 18 and 19. You should get a reading between 14 and 19. Write your reading here: ____________. ○

97. The reading of between 14 and 19 must be multiplied by 10. In the case of this resistor, the reading you took, times 10, indicates a resistance of somewhere between 140 and 190 ohms. Multiply your reading and then write the resistance here: ____________. ○

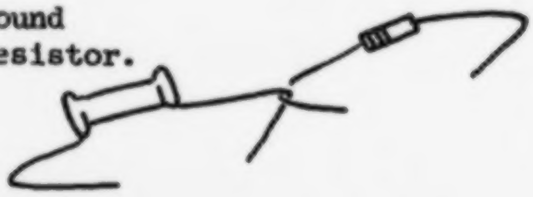
98. On the Parts Sheet next to the place where the light brown - green - light brown resistor was lying are the words light brown - green - light brown. Next to those words write the number you wrote in item 97. ○

99. Now pick up the grey 15 ohm resistor that you measured before and put it on the table beside the brown - green - brown resistor ○

100. The wires of the 15 ohm resistor are already bent like this. Now bend the wires from the other resistor so that they both look approximately like this: ○

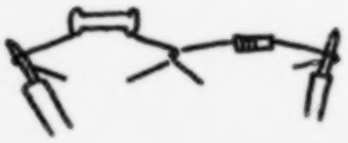


101. Hook one wire from the 15 ohm resistor around one wire from the brown - green - brown resistor. ○



102. The 15 ohm resistor and the brown - green - brown resistor are now connected in series with each other, end to end. Their total resistance is simply the sum of 15 plus the resistance you measured for the brown - green - brown resistor. Add these two numbers and then write the total resistance here: ____________. The total is between 150 and 200. ○

103. Put the tip of one lead inside the loop of the 15 ohm resistor wire and the other lead inside the loop of the brown - green - brown resistor as shown in the drawing. Pull the leads away from each other slightly until the connections are firm. Read the meter. The red hand is between 15 and 17; write the reading here: _______. ○



104. The scale reading is between 15 and 20. Write your reading here: ____________, and multiply it by ten to get the resistance. Write the resistance here: ____________ ohms. It is approximately between 150 and 200 ohms. ( )

105. Now straighten the wires on both of the resistors like this: ( )

106. Put the 15 ohm resistor and the brown - green - brown resistor back on the Parts Sheet in their appropriate places. ( )

107. Pick up the resistor with green - blue - red stripes on it. Look closely to be sure you have picked up the green - blue - red striped resistor. Lay the resistor on the table in front of you, beside the meter. ( )

108. Now turn the dial of the meter until the white triangle points directly at $\overset{RX1}{K\Omega}$. ( )

109. Touch the tips of both leads together and hold them together with your left hand. ( )

110. Continue to hold the tips of the leads together, and with your other hand adjust the black knob in the lower right hand corner of the meter so the red hand points exactly at 0 ohms in the upper right hand corner of the meter. ( )

111. Now put one lead in each hand and touch one lead tip to each wire from the green - blue - red resistor. Look at the red hand and the ohm scale. The red hand is between 5 and 6, close to the line representing 5.5. Lay the leads on the table. ( )

112. The red hand was not exactly at 5.5, it actually reads between 5.2 and 5.8, which is difficult to estimate. Write 5.6 here: ____________. ( )

113. The dial is set at $\overset{RX1}{K\Omega}$. 1K means 1,000, so instead of multiplying the reading by 10, you multiply by 1K or by 1,000. Multiply 1,000 X 5.6 and write the resistance here: ____________. ( )

114. The green - blue - red resistor has a resistance of 5,600 ohms. Write 5,600 ohms on the Parts Sheet beside the printed words green - blue - red, and put the resistor on the Parts Sheet on the place you just located for it. ( )

115. Now pick up the small metal can. Read the side of the can on which is printed:

40 MFD 150 V A
20 MFD 150 V B
5 MFD 150 V C
NEGATIVE -

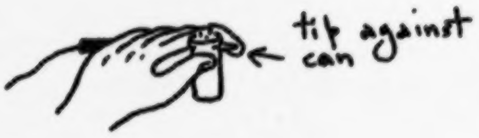
the 40, 20 and 5 MFD markings indicate that this can contains three capacitors. ( )

116. Stand the capacitor can upside down on the table with the four prongs pointing up in the air. ☐

117. Turn the can so the longest prong is furthest from you. ☐

118. Pick up the black lead in your left hand and hold the lead with your left index finger against the metal tip of the lead. ☐

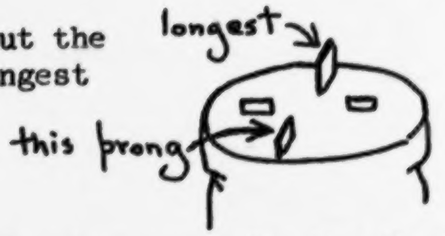
119. With your right hand pick up the can capacitor and put it into your left hand between your left thumb and the metal tip of the black lead so the tip of the lead touches the side of the can. ☐



120. Hold the tip of the black lead firmly against the metal can. Check the meter dial to be sure it is set at $\overset{RX1}{K\Omega}$. ☐

121. Put the meter directly in front of you and hold your left hand directly above the meter dial. You can now see the meter scale and the capacitor can at the same time. ☐

122. Look at the top of the capacitor can and pick out the short prong directly across the top from the longest prong. ☐



123. In the next item you must watch the meter closely when you make the tests so that you will be able to see the meter hand move. You must look at the meter hand while you touch the prongs. Now go on to the next item. ☐

124. Pick up the red lead in your right hand. Watch the meter scale closely and then touch the tip of the red lead to the short prong opposite the long prong, and hold the tip of the lead on the prong. The red hand swings to the right then slowly moves back to the left. As soon as the hand starts to move back to the left, remove the red lead from the prong. ☐

125. The red hand swung over to the right then slowly moved to the left. Now shift the can to your right hand and hold the tip of the red lead against the can. ☐

126. Watch the meter scale closely and touch the black lead to the same short prong you touched before. See the red hand go over toward the right then slowly back to the left. ☐

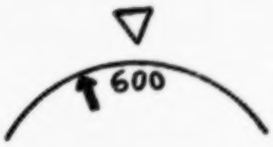
127. Put the can back in your left hand against the tip of the black lead. ☐

128. Watch the meter scale and touch the red lead to the same short prong again. See the red hand again move over toward the right, then slowly back to the left. Lay the leads down on the table. ☐

129. Put the capacitor can back on its correct position on the Parts Sheet. ☐

130. Later, after the tubes are in their sockets, you will take some checks on the tubes. Now look on the meter dial and find a black arrow on the dial. ☐

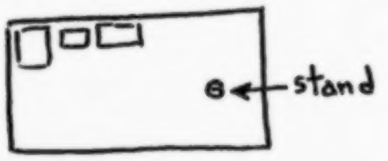
131. Turn the meter dial clockwise, ↷, until the white triangle points at the number 600 right beside a black arrow. ☐



132. Put the meter and the leads over on the right side of the table. ☐

133. Remove the soldering iron and the metal stand from the yellow box. Lay the metal stand on the table. Unwrap the coiled wire of the soldering iron and unbend all kinks in the wire. ☐

134. Put the bent metal wire stand on the table to your right. ☐



135. Take a piece of steel wool and polish the tip of the soldering iron until it is shiny and smooth-looking. Polish from the tip back about one inch. ☐

136. Rest the soldering iron on the metal stand so the tip of the iron is not touching the stand. ☐

137. Be sure the soldering iron is far enough from the part of the table in front of you where you will be working. If the iron is too close, you might accidentally touch it and be burned. ☐

138. Be sure the tip of the iron is not touching the table or the metal stand, or its own cord; then insert the plug on the soldering iron cord into an electrical power socket. ☐

139. CAUTION: Do not touch the tip of the soldering iron now that it is plugged in. Hold your hand near - about 1/2 inch - from the tip and see if the tip is beginning to get warm. It will take a minute or two. ☐

140. Take the brown back of the radio out of the yellow box and lay it on the table in front of you, with the printed side face down on the table, and the metal shield away from you. ☐

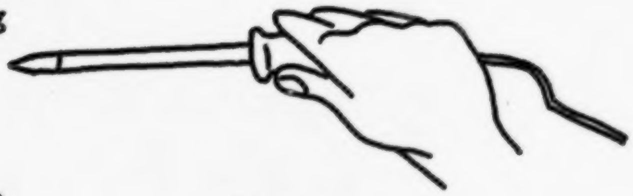
141. Take the small blue paper bag out of the yellow box and remove the coiled piece of soft wire. This is solder. Put the solder on the table near the back of the radio, and then remove all the paper clips and lay them beside the solder. There are 8 paper clips. Discard the blue envelope. ☐

142. Now pick up the soldering iron by the wooden handle. CAUTION: Be very careful not to touch the metal parts of the soldering iron or you can burn yourself painfully. ☐

143. CAUTION: Hold your hand no closer than one inch from the tip of the soldering iron, and you can feel the heat of the iron. ☐

144. Pick up the coil of the solder and bend out one end of it. ☐

145. Hold the solder in your left hand, and with your right hand pick up the soldering iron by its wooden handle. Hold the soldering iron like this: ☐



146. Touch the end of the solder to one of the flat sides of the tip of the soldering iron and put a thin coating of solder all over the flat side of the tip. Completely cover the flat side of the soldering iron tip with solder. ☐

Solder all over flat tip

147. Now turn the iron so you can put solder on the other flat side of the tip. Put a thin coat of solder over the entire flat surface of this other side of the tip. ☐

148. If the solder flowed smoothly onto both sides of the tip of the soldering iron, skip to Item 149; if not, go on to Item 148a. ☐

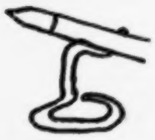
148a. If the solder does not smoothly cover the entire tip of the iron giving it a silvery look, lay the solder down, and put the iron back on the stand. ☐

148b. If the iron did not get smoothly coated with the solder, unplug the iron, let it cool for a minute or so and then use steel wool again to shine the tip. (See step 135) Then plug the iron in again and let it heat. ☐

148c. Repeat steps 145 and 146. ☐

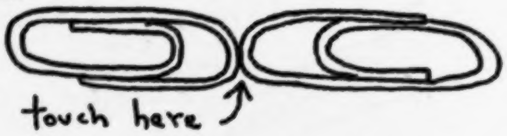
149. Put the solder on the table beside the Parts Sheet, then hold the soldering iron so the tip is over an ash tray and shake it sharply to shake off any excess solder into the ash tray. ☐

150. Put the iron back on the stand. Remember to let the tip extend out past the stand like this: ☐

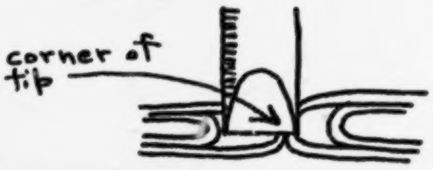


151. Soldering is not a difficult job, but it must be done correctly to make good electrical connections. Lay two paper clips onto the back of the radio. ☐

152. Lay the paper clips beside each other so their ends just touch each other. ☐

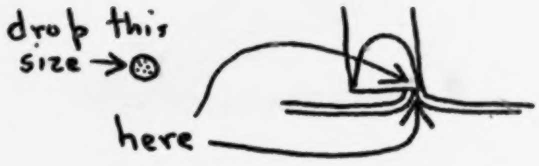


153. Now pick up the soldering iron and hold one corner of the tip down firmly on the two paper clips at the point where they touch each other. Do not press hard, just hold the iron firmly against the two clips, and do not move the clips. ☐



154. Count slowly to 10. The handle of the soldering iron is getting warm, but don't worry about that, it should get very warm. ☐

155. Now, without lifting the iron, pick up the solder in your other hand and touch the end of the solder to the tip of the soldering iron where it touches both clips; let only one large drop melt and run onto the paper clips. ☐

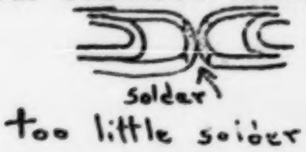


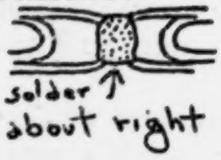
156. Now again touch the tip of the solder to the place where the soldering iron and both paper clips meet and let a second large drop of solder flow onto the connection. ☐

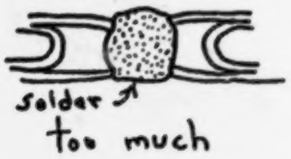
157. Lay the solder down on the table. Carefully lift the soldering iron off of the two paper clips without moving the clips apart, and put it back on the stand. ☐

158. Let the two paper clips cool for a full minute before you touch them, because they are very hot. After a minute, they will be cool enough; gently pick them up and inspect the joint where they are now soldered together. ☐

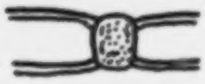
159. It is important to have used enough solder, but not too much. Check the drawing your soldered connection most resembles. ☐







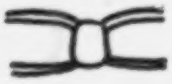
160. Now you are ready to solder two more clips together, using this drawing as your model. First, put two more clips onto the back of the radio so they touch. ○



161. Pick up the iron and press the tip firmly against both clips at the point where they touch. ○

162. Wait about 10 seconds for the connection to heat, then pick up the solder and touch the tip of the solder to the point where the soldering iron touches both paper clips. Let one drop melt and flow onto the two clips. ○

163. Add enough additional solder to make the connection look like this: Then put the soldering iron back on its stand. Do not touch the paper clips until a full minute has passed. ○



164. Practice a third time with two more clips, repeating steps 160, 161, 162 and 163, remembering to heat the connection before you add solder. ○

165. Repeat steps 160 through step 163 a fourth time, again using two more paper clips. Then put the back of the radio back into the yellow box. ○

166. Now put the soldering iron back on its stand, and put the solder beside the Parts Sheet. Put the paper clips back into the yellow box. ○

167. Unplug the soldering iron. ○

168. If you are going to stop now, turn to Page 2 and read the instructions that appear there with the title "Instructions on Putting the Kit Away When You Stop". If you are going to continue on to Unit B immediately, turn the page and begin, after you take a 10 minute rest. ○

END OF UNIT A

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READ EACH ITEM COMPLETELY, ALL THE WAY TO THE END OF THAT ITEM, AND THEN DO EVERYTHING THE ITEM TELLS YOU TO DO.

RADIO UNIT B

1. If you did not start this Unit immediately after finishing Unit A, go on to Item 2. If you did go on immediately, skip to Item 3. ☐

2. Take the Parts Sheet out of the yellow box, put the Parts Sheet to your left and put all the parts on it as before.
   Now look at all the parts and put a check in the circle when you have located each part. You should have:

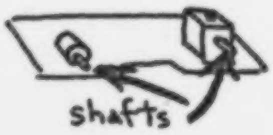
   - 4 radio tubes ☐
   - 3 small resistors ☐
   - 1 large grey resistor ☐
   - 1 small knob ☐
   - 1 large tuning knob ☐
   - 1 screw ☐
   - 1 OSC coil ☐
   - 1 CR 150 tan block ☐
   - 2 grey SEICO knobs ☐
   - 5 colored wires ☐
   - 4 sockets ☐
   - 3 green wafer capacitors ☐
   - 1 white capacitor ☐
   - 1 small metal can ☐
   - 1 IF Transformer ☐

3. Put the radio case in front of you, with the open back facing you. ☐

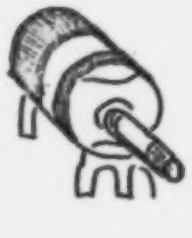
4. Notice that the ends of the tan circuit board slide in tracks on each side of the radio, and then slide the tan circuit board out of the radio case. Hold the circuit board in one hand, and put the radio case back beside the Parts Sheet. ☐

5. Lay the circuit board on the table in front of you with the two metal objects, which are two of the radio components, on top of the board. ☐

6. Turn the board so that the shaft sticking out of each component points toward you. ☐

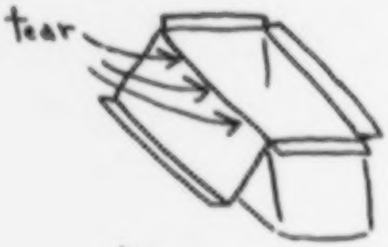


7. The component on the left is the off-on switch and the volume control. Turn this shaft clockwise, ↷, until it clicks on, then turn it counter-clockwise, ↶, until it clicks off again. ☐

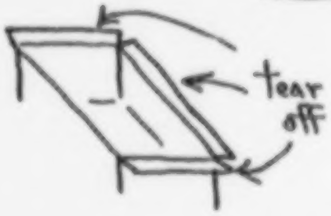


8. The component on the right is the variable capacitor that adjusts the station. Turn the shaft of the variable capacitor all the way to the left, counter-clockwise, ↶, and leave it turned that way. ( )

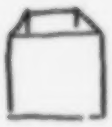
9. Put the yellow box in front of you beside the circuit board. Let the items that are in the box remain there. Tear off the lid along the top edge of the box. Discard the lid. ( )



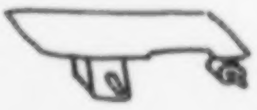
10. Tear off the three small flaps from the other side and two ends of the yellow box. Throw away the three flaps. ( )



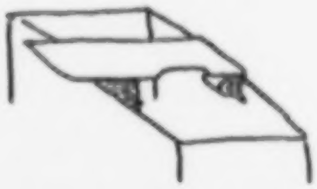
11. Place the box so one end is pointing toward you. ( )



12. Pick up the circuit board; turn it upside down so the volume control and variable capacitor are underneath the board, but so the shafts are still toward you. ( )



13. Lay the circuit across top of the yellow box, about halfway between the two ends. Pull the sides of the box apart so the two components fit inside the box with the circuit board resting on the box. ( )



14. Look closely at the surface of the circuit board. This is called a printed circuit. Each copper strip is a conductor that connects components just as a wire would. Find the 5 soldered connections for the volume control and look closely at them. This is a good soldering job! ( )

15. The volume control is on your right. Notice how it was soldered onto the board. The solder has flowed onto the copper strips and also up the sides of the prongs from the volume control and looks shiny. Look closely at these connections because your soldered connections should look exactly like them. ( )

16. The other components of the radio are to be soldered to the circuit board also, and wires will come through the holes in the board. Look at the volume control connections and see how many different copper paths they are connected to. ( )

17. Get the meter and put it on the table in front of you. Plug in the two short ends of the leads, putting the short end of the red lead into the hole marked plus (+), the short end of the black lead into the hole marked minus (-). ( )

18. Set the meter dial so the white triangle points to $\overset{RX1}{K\Omega}$. ☐

19. Hold the meter ends of the leads together with one hand, and with the other hand adjust the small round knob on the meter until the red hand points exactly at zero (0) on the top black scale. ☐

20. Now take any one of the five colored wires off of the Parts Sheet and lay it on the table in front of you. ☐

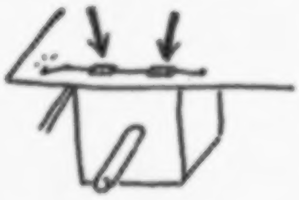
21. Touch the tip of one lead to one bare end of the colored wire and the tip of the other lead to the other end of the colored wire. ☐

22. Continue to hold the leads in place and look at the meter. The red hand has swung all the way over to zero because the wire is a good conductor. Lay the leads on the table and put the colored wire back on the Parts Sheet. ☐

23. Move the yellow box in front of you beside the meter. Be sure the shafts of the components point toward you. ☐

24. Look at the circuit board. Each copper strip is like a wire that can conduct current. Notice that some strips are very short and others are very long. ☐

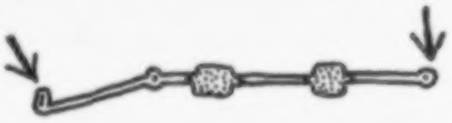
25. Look at the edge of the circuit board nearest you. Find the two large soldered connections just above the shaft on the left. Notice that the two connections are connected by a copper strip. ☐



26. Pick up one lead in each hand and touch one lead to each of the two large soldered connections you just looked at and look at the meter hand. ☐

27. The meter hand went all the way over to the right because the soldered connections are connected to each other by a copper strip. Now lay the leads on the table. ☐

28. Now look closely at the copper on each side of the two connections you just tested, and find the ends of the copper strip. ☐



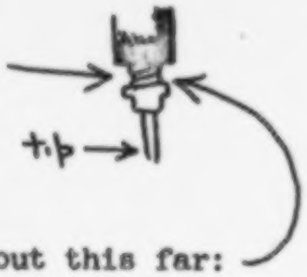
29. Pick up the leads again, one in each hand, and put the tip of one lead into the slot at the left end of the strip, and the other lead into the hole at the other end of the copper strip. Look at the meter hand, and see that it has moved all the way to the right. ☐

30. Lay the red lead on the table. Read all of the next 7 items without doing anything, and then return to this item and follow the instructions in the items one by one. ☐

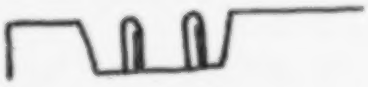
31. Hold the metal tip of the black lead in your hand with the tip down and the black handle in the air. ☐

32. Take hold of the black handle and turn it counter-clockwise, ↶, still holding tight to the metal tip with your other hand. The black handle will unscrew from the metal tip. ☐

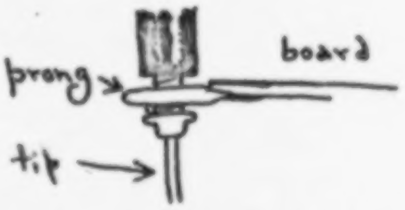
33. Continue to unscrew the handle until it is unscrewed about this far: Continue to hold the black lead in your hand. ☐



34. Now look at the back of the circuit board and locate 2 metal prongs sticking out of the back edge of the board, near the left hand edge. ☐



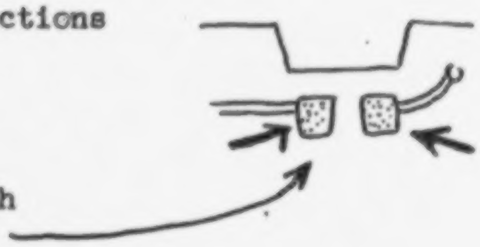
35. The black lead is to be placed between the two prongs you just looked at, with the black handle above the prongs and the metal tip below the prongs. First look closely at this picture. ☐



36. Slip the black lead in between the 2 prongs, holding the metal tip of the lead in one hand and the black handle in your other hand. Turn the handle clockwise ↷, screwing the handle down tight against the prongs. ☐

37. Now let go and the lead will remain in place, held by the black handle. If the lead is too unsteady, turn the black handle clockwise a little more to tighten it. ☐

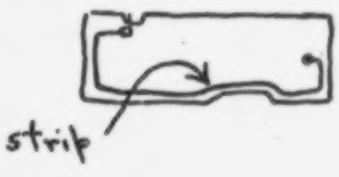
38. Now look closely at the two large soldered connections above the two prongs holding the black lead. ☐



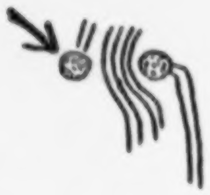
39. Pick up the red lead in your right hand and touch the large soldered connection on the left. ☐

40. Now lift the tip of the red lead slightly up in the air, about a half inch and use it as a pointer to follow the path of the copper strip from the large prong at the left as it goes along the edge of the board all the way to the other end of the board to a soldered connection of the volume control. ☐

41. Touch the red lead to the volume control connection you just located and look at the meter. The red hand moved over to zero because the long copper strip connects both connections just as a wire would. ☐



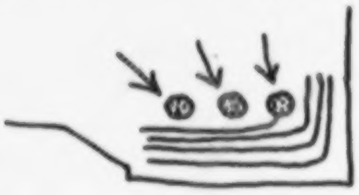
42. Now touch the red lead to the volume control connection closest to the one you just touched. Look at the meter. The red hand did not move. ☐



43. The red hand did not move because the off-on switch is turned off. With your free hand, reach into the box and without moving the circuit board, turn the volume control shaft to the right, clockwise ↷, until it clicks on. Let go of the shaft. ☐

44. Now touch the second volume control connection, the one you touched last, and watch the meter hand. It moves because the switch is now turned on, completing the path between the two leads. ☐

45. Lift the red lead but continue holding it while looking at the right front corner of the circuit board above the volume control shaft. Find three soldered connections. ☐



46. With the tip of the red lead touch the center connection of the three you just looked at. Continue to hold the red lead on the connection while you take hold of the volume control shaft and turn it backward and forward. Watch the meter hand swing back and forth. ☐

47. The volume control makes the radio play louder or softer, and it also made the hand move back and forth. Put the red lead down on the table. ☐

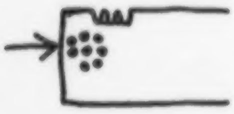
48. You checked the copper strips and saw how they act just like a wire connection. You also checked the off-on switch and the volume control, which moved the meter hand just as they turn the radio on-off and louder or softer. Now remove the black lead from the two prongs. ☐

49. Screw the black handle against the metal tip of the black lead and put the meter and the leads aside again, out of your way. ☐

50. The coil of solder is beside the Parts Sheet. Reach under the circuit board and into the yellow box and remove the screw driver and put it near the Parts Sheet with the solder. ☐

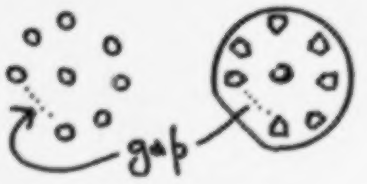
51. Put the soldering iron and stand over to your right. Be sure the iron is resting on the stand and that the soldering iron cord is away from the tip. Plug in the soldering iron. ☐

52. At the left edge of the board, just to the left of the tuner capacitor there are seven fairly large holes arranged in a circle, with an eighth hole in the center. Look for these holes. ☐

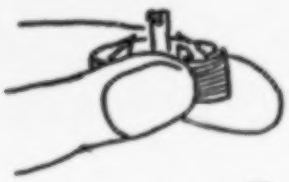


53. On the Parts Sheet are four sockets with metal prongs. Three of the sockets are alike, one is a bit different. Pick up any one of the three identical sockets. ☐

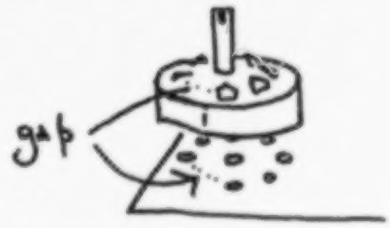
54. Look at the socket. It has 7 prongs around the outside edge and a round post in the middle. There is a gap between two of the prongs, look for a gap also between 2 of the holes you just looked at. ☐



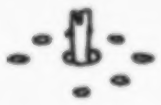
55. Hold the socket in your left hand so the prongs point up in the air. ☐



56. Hold the socket above the holes you just looked at on the circuit board and turn the socket so the gap between two prongs is right above the gap between two holes. ☐



57. Now put the socket underneath the circuit board, under the holes you just looked at. Push the socket up against the circuit board so the center post of the socket starts into the hole in the center of the other holes. ☐

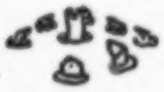


58. Look down at the holes and be sure you can see one prong under each of the 7 holes arranged in a circle. Straighten any prongs that are not in line with the holes, by bending them with your fingers. ☐

59. Hold the circuit board down with one hand while you push up on the socket so the prongs start into their holes. Be sure a prong is entering each hole. ☐

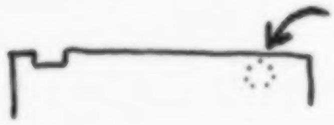
60. Push up hard on the socket until it clicks into place and stays there without being held. ☐

61. Look at this drawing and then look at the socket you just inserted. This is how your socket should look. Count the prongs and see that all 7 came through the holes in the circuit board. ☐



62. Grasp the socket under the board and try to gently wiggle it back and forth. There is almost no free movement. ☐

63. Directly in back of the volume control, close to the edge of the board that is furthest from you is another set of seven holes in a circle with an eighth hole in the center. Look for these holes. ☐



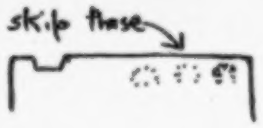
64. Pick up another one of the three identical sockets. Just as you did with the first socket, line up the prongs with the holes, and use your fingers to straighten any prongs that are bent out of line. ☐

65. Then insert the prongs from underneath the board into the holes you just looked at. Guide the prongs into the holes. ☐

66. Look at the prongs of the socket you just inserted and compare their appearance with the appearance of the first socket you inserted. ☐

67. Hold the socket you just inserted and try to juggle it. It should not move easily. ☐

68. Just to the left of the socket you just inserted you will see another set of socket holes. Look for them. Skip these holes for now.



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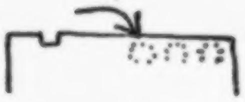
69. Just to the left of the socket holes you just looked at is another set of socket holes. Look for them.



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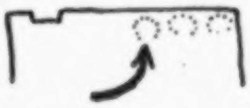
70. Pick up the last of the three identical sockets from the Parts Sheet, and with your fingers straighten any prongs that are bent out of line. ☐

71. Hold the socket prongs up in the air and insert it from the underside of the board into the last set of holes you looked at. Guide the prongs into the holes.



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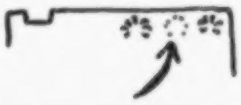
72. Hold the socket you just inserted and try to juggle it. It should not move easily. ☐

73. Look at the prongs of the socket you just inserted. They should look like the prongs of the other two sockets. ☐

74. Between the two sockets you just inserted is the set of socket holes you looked at before but skipped. Look at them again and be sure that you did skip them.



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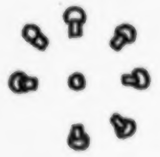
75. From the Parts Sheet pick up the last socket, the one that is different from the other three. With your fingers, straighten any prongs that are bent out of line. ☐

76. Line up the prongs with the holes and then from the underside of the board, insert the prongs of this last socket into the holes you just looked at. Hold it in place with one finger, the prongs will not hold it. ☐

77. Hold the socket in place by putting one finger under the circuit board and holding the socket so the prongs remain sticking through the holes. ☐

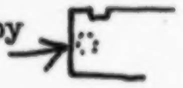
78. With your other hand, pick up the screw driver and bend the prongs of this last socket toward the center hole. Bend them down as flat as possible against the circuit board; bend all seven prongs. ☐

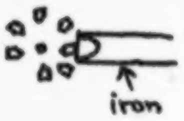


79. Put the screw driver back on the table near the Parts Sheet. ☐

80. CAUTION: the soldering iron is hot. Pick up the soldering iron in one hand and the coil of solder with the other hand. ☐

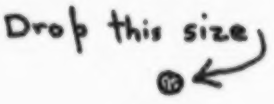
81. Choose any one of the prongs of the socket located by itself at the left edge of the circuit board. Hold the soldering iron against the outside back of the prong. ☐





82. Hold the iron so it presses firmly against both the prong and the copper ring that surrounds the hole through which the prong projects. Hold it there for about 5 seconds. ☐

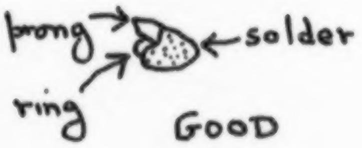
83. Without lifting the iron, touch the tip of the solder to the place where the soldering iron touches both the prong and the copper ring. Let only one drop of solder melt onto the connection. ☐

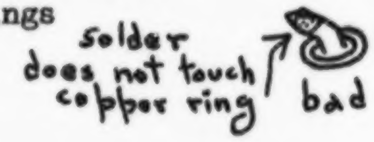


84. Continue to hold the soldering iron in place. Touch the tip of the solder to the same spot again and let another large drop of solder flow onto both the prong and the copper ring. ☐

85. Take the soldering iron away from the connection. Lay the iron down, resting it on the stand. ☐

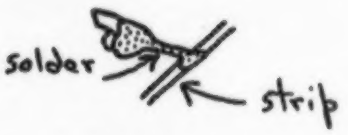
86. Inspect the soldered connection you just made. It should look like this. Be sure you have enough solder. Examine these drawings carefully. ☐



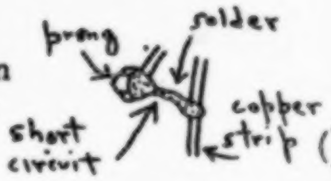


87. If you have too much solder, leave it there, but if you have too little solder, hold the iron to the connection again until the solder already on the connection melts, then add one more drop of solder. Then put the soldering iron back on its stand. ☐

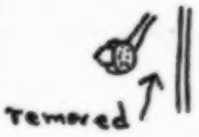
88. If you used too much solder, it might have flowed from the copper ring across to another copper ring or copper strip. If you use too much solder and it flows from one copper strip across to another you will have a short circuit and the radio will not work. Look closely at your soldered connection. If there is no short circuit, skip ahead to Item 89. If there is a short circuit, go on to the next item, Item 88a. ☐



88a. If you have a short circuit, first pick up the soldering iron and shake it over an ash tray to shake any excess solder off of the tip of the iron. ☐



88b. Next touch the tip of the iron to the solder that has flowed across the space between copper strips. The solder will flow onto the iron and the short circuit connection will be gone. Remove the soldering iron. Shake the excess solder off of the iron, then put the soldering iron back on its stand. ☐

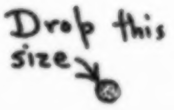


89. Now at least half a minute has passed and you can lightly touch the one prong you just soldered to see if it has cooled completely. ☐

90. When the connection is completely cool the solder should be lying smoothly on both the prong and the copper ring, and should be shiny like the connections of the volume control. Look at your connection and notice that the solder lies smoothly and is shiny. ☐

91. Now pick up the soldering iron again. Hold it against another prong of the same socket, the socket at the left side of the board away from the other three sockets. Be sure the soldering iron touches both the prong and the copper ring around the prong. You can turn the yellow box any way you want to in order to get at the prong more easily. ☐

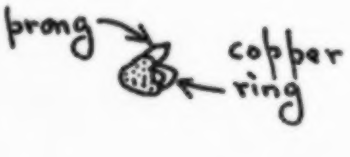
92. After about 5 seconds pick up the solder and touch the tip of the solder to the tip of the iron where the iron touches both prong and copper ring. Let one drop of solder flow onto the connection. Continue to hold the soldering iron against the prong and copper ring. ☐



93. Now add one more drip to the connection by touching the solder to the other drop of solder that touches both the prong and the copper ring. ☐

94. Remove the soldering iron from the connection. Replace it on its stand. Lay the solder on the table near the Parts Sheet. ☐

95. Look at the connection you just made. Compare its appearance with the first connection and with this sketch. There should not be too much or too little solder. Be sure you have enough solder like this: See that solder has flowed onto both the prong and the copper ring. ☐



96. You have now soldered two prongs on this socket. Pick up the soldering iron and solder a third prong. First heat the prong and copper ring for about five seconds. Turn the yellow box so you can reach the prong easily. ☐

97. Touch the tip of the solder to the place where the iron touches both the prong and the copper ring. Let one drop of solder flow onto the connection, then take the tip of the solder away from the connection, but keep the soldering iron against the connection. ☐

98. Touch the tip of the solder to the connection again and let one more drop of solder flow onto the connection. Take the soldering iron and solder away from the connection. ☐

99. Hold the soldering iron against a fourth prong for about 5 seconds. Be sure the tip of the iron touches both the prong and the copper ring. Turn the yellow box if necessary. ☐

100. Touch the tip of the solder to the soldering iron where it touches the prong and the copper ring. Let one drop of solder flow onto the connection. ☐

101. Add one more drop to the connection. Remove the soldering iron from the connection. ☐

102. Solder the fifth prong. First heat the connection for 5 seconds. ☐

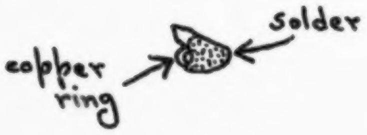
103. Put one drop of solder on the connection. Then put a second drop of solder on the connection. ☐

104. Move the soldering iron to the sixth prong. Heat the connection for 5 seconds. ☐

105. Put one drop of solder on the connection. Then put a second drop of solder on the connection. ☐

106. Move the soldering iron to the seventh prong. Heat the connection for five seconds, put two drops of solder on the connection. When the solder has flowed, remove the soldering iron and replace it in its stand. Lay the solder on the table near the Parts Sheet. Do not solder the center post. ☐

107. Now inspect all 7 prongs. Compare them with the connections of the volume control. The solder should look shiny.



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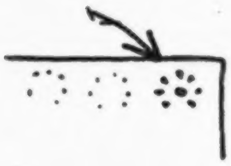
109. Look closely at both the prongs and the copper rings. If the solder flowed smoothly against both the prongs and the copper ring, and looks shiny, skip to Item 110. If not, go on to Item 109a. ☐

109a. If the solder looks dull, or if it has not flowed smoothly onto both the prongs and the copper rings, take the soldering iron and re-heat the connection until the solder melts and flows smoothly onto both the prong and the copper ring. Replace the soldering iron on its stand. ☐

110. Now look closely at the socket prongs in the upper right hand corner of the circuit board. Notice that the center post has no copper ring around it.



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111. Look also at the seven prongs. Find the two prongs that do not have copper rings around them. ☐

112. The center post and the two prongs that have no copper rings are not to be soldered. Pick up the soldering iron and hold it against one of the prongs that does have a copper ring around it. Turn the box whenever it is necessary. ☐

113. Heat the connection for about 5 seconds, then add one drop of solder to it. Then add a second drop of solder. Do not remove the soldering iron until the solder flows onto both the prong and the copper ring. ☐

Drop this size

114. Move the soldering iron to a second prong surrounded by a copper ring. Heat the connection, then add two drops of solder. When the solder has flowed onto both connections, remove the soldering iron from the connection. ☐

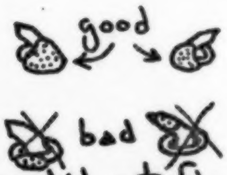
115. Move the soldering iron to a third prong surrounded by a copper ring. Heat the connection, add two drops of solder, then remove the soldering iron from the connection. ☐

116. Move the soldering iron to the fourth one of the five prongs that is surrounded by a copper ring. Heat the connection, add two drops of solder. When the solder has flowed onto both connections, remove the soldering iron. ☐

117. Place the soldering iron against the connection between the fifth prong and its copper ring. Heat the connection, add two drops of solder. When the solder has flowed onto the prong and the ring, remove the soldering iron and replace it in its stand. Put the solder on the table near the Parts Sheet. ☐

118. Now count the connections you just soldered and see that you soldered all 5 prongs that have rings around them. ☐

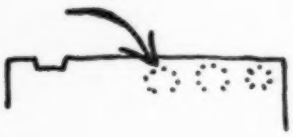
119. Now inspect all 5 connections and see that you have used enough solder. If the solder is shiny and flowed onto both the prong and the copper ring, skip to Item 120. If not, go onto Item 119a. ☐



solder did not flow onto both prong and ring

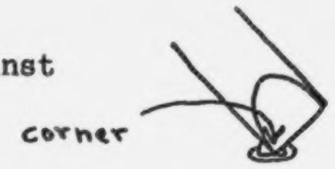
119a. If the solder is not shiny or has not flowed smoothly onto both the prong and the copper ring, re-heat the connection until the solder flows smoothly onto both the prong and the copper ring, then put the soldering iron back on its stand. ☐

120. Just to the left of the socket you just soldered is the socket with the prongs you had to bend. Skip it for now and look at the third socket with the prongs that snapped into place. Notice that all 7 prongs and the center post have a copper ring. ☐



121. Notice that the copper strips on the board come very close to some of the copper rings. Look at the way that the rings are very very close to some copper strips. When soldering the prongs of this socket, do not solder any short circuits by letting too much solder flow from any copper ring to any of the copper strips. ☐

122. Pick up the iron and hold one corner of the tip against one prong and its copper ring.



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23. Hold the soldering iron almost straight up in the air and look to see that it doesn't touch a copper strip near the ring, because if it does, you might solder a short circuit onto the circuit board. ☐

24. Heat the prong and ring for about 5 seconds, add two drops of solder. When the solder has flowed smoothly onto both the prong and the ring, remove the soldering iron. Turn the box whenever necessary. ☐

25. Solder the second prong using a corner of the tip of the iron. First heat prong and ring, add two drops of solder. When the solder flows, remove the iron. ☐

26. Repeat the soldering procedure on the third prong. Remember to use a corner of the tip. ☐

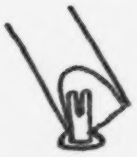
27. Solder the fourth prong. ☐

28. Solder the fifth prong. ☐

29. Solder the sixth prong. ☐

30. Solder the seventh prong. ☐

31. Hold the one corner of the tip of the iron against the center post of the socket. The center post is larger and heats more slowly, so wait longer, about a half minute, for the connection to heat.



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32. Put two large drops of solder on the connection. When it flows, add another large drop, then add another large drop to the side of the post away from the soldering iron, and surround the center post with enough solder, but do not use too much solder.

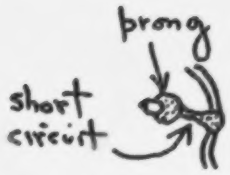
☐

33. As soon as the solder has flowed smoothly onto the center post and the copper ring, remove the soldering iron. ☐

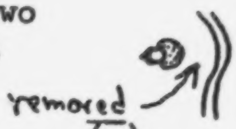
34. Put the soldering iron back on its stand and put the solder near the Parts Sheet. Look closely at the seven prongs and the center post you just soldered. If the solder is shiny and if the solder flowed smoothly onto each connection, skip to Item 135; if not, go on to Item 134a. ☐

134a. If the solder is not shiny, or did not flow smoothly, pick up the soldering iron and re-heat the connection until the solder does flow smoothly. Put the soldering iron back on its stand. ☐

135. Look closely at all connections of all sockets. Did you put too much solder on any connection so that it flowed from the copper ring to another copper strip? If not, then skip to Item 136. If solder did flow across from a copper ring to a copper strip, go on to the next item, Item 135a. ☐



135a. If solder has flowed across making a connection between two copper strips on the circuit board, you have soldered in a short circuit and it must be removed. First shake any excess solder off of the tip of the soldering iron. ☐



135b. Put the tip of the soldering iron onto the solder making the short circuit connection. The excess solder will flow back onto the soldering iron and break the connection between the copper strips. ☐

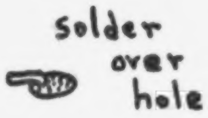
135c. Remove the soldering iron, shake off the surplus solder and put the iron back on its stand. ☐

136. The only socket remaining unsoldered is the socket with the prongs you had to bend. Notice that this socket has no center post. Look for the one prong that has no copper ring around it. Do not solder this prong. ☐

137. Pick up the soldering iron and hold it against one prong with a copper ring around it and against the copper ring. ☐

138. After counting 5 seconds, put one large drop of solder on the connection. After this drop of solder flows smoothly, add a second drop. Remove the iron by wiping or sliding it back off the ring and lifting it, trying to cover the entire hole with solder. ☐

139. When you slid the iron off the ring, solder should have covered the entire hole through which the prong appeared. If it did not, put the tip of the iron back on the connection and add more solder until the hole is covered with solder, then immediately remove the soldering iron. ☐



140. Solder a second prong and copper ring as you did the first prong. Be sure the hole is completely covered with solder but not by a large blob of solder. ☐

141. Solder a third prong and ring. Heat for 5 seconds, add two drops of solder, slide the soldering iron off of the ring to cover the hole with solder. ☐

142. Solder a fourth prong and ring. Be sure the hole is covered. ☐

143. Solder a fifth prong and ring. Be sure the hole is covered. ☐

144. Solder the last prong and ring. Be sure the hole is covered. ☐

145. Put the soldering iron back on its stand. Put the solder near the Parts Sheet. ☐

146. Inspect the connections you just made. If the solder is shiny, flowed smoothly onto prongs and copper rings and filled the holes, skip to Item 147. If not, go on to Item 146a. ☐

146a. If the connections are not shiny, smooth and covering the hole, re-heat the connection and add more solder if necessary after the solder on the connection begins to flow. Replace the soldering iron on its stand. ☐

147. Now all the tube sockets have been soldered. Starting with the socket on the left, count the number of connections you have soldered on each socket. Write the numbers here:

a. 1st tube on the left ________ connections

b. tube on the far right ________ connections

c. next tube with the bent prongs ________ connections

d. next tube that is third from the right (count the center post too) ________ connections ☐

148. Now check the number you wrote in Item 147 and make sure you have counted correctly and have soldered every connection. Check your number with these:

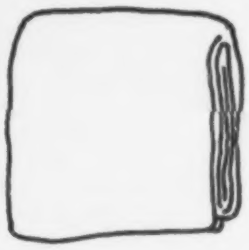
a. 1st tube on the left, 7 connections

b. tube on the far right, 5 connections

c. next tube with the bent prongs, 6 connections

d. next tube that is third from your right, 8 connections ☐

149. Obtain a paper towel or a large piece of tablet paper. Wet it until it is wet through but not dripping. Fold the paper into a pad about this size.



☐

150. Lay the wet paper on the table in front of you. Pick up the soldering iron while it is still plugged in and wipe off the tip against the wet paper. Do this on both sides of the tip. ☐

151. Now look at the tip. It should look silvery and not discolored. If it is discolored, wipe it on the wet paper pad again, until the tip is clean and silvery. Put the iron back on its stand; discard the paper pad. ☐

152. Unplug the soldering iron. ☐

153. If you are going to stop now, turn to Page 2 and read the instructions that appear there with the title "Instructions on Putting the Kit Away When You Stop". If you are going to continue on to Unit D immediately, turn the page and begin, after you take a 10 minute rest. ☐

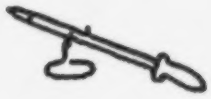
END OF UNIT B

PRECEDING PAGE BLANK-NOT FILMED

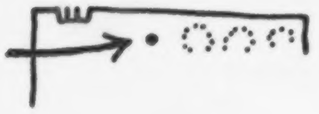
READ EACH ITEM COMPLETELY, ALL THE WAY TO THE END OF THAT ITEM, AND THEN DO EVERYTHING THE ITEM TELLS YOU TO DO.

RADIO UNIT C

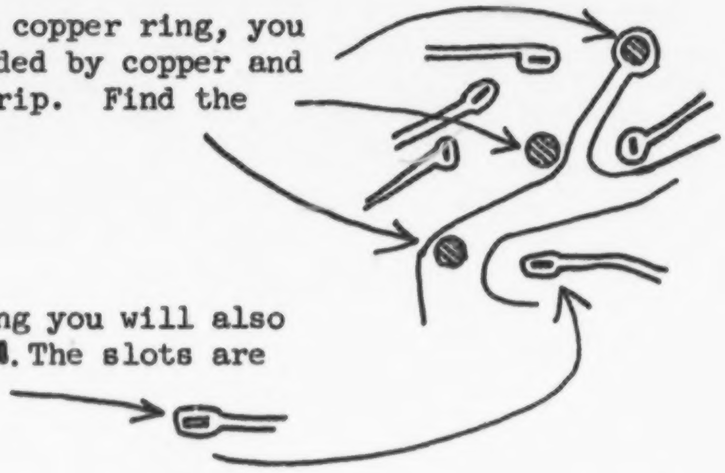
1. If you did not stop after Unit B, but came right on to Unit C, skip to Item 3. ☐
2. If you had put away the kit after completing Unit B, take the Parts Sheet and all parts out of the yellow box and arrange them as before. ☐
3. Be sure the soldering iron is resting on its stand with the tip not touching the stand or the table. ☐



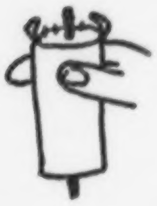
4. Plug in the soldering iron. ☐
5. Position the yellow box on the table in front of you, with the circuit board on top of it as before, and with the two shafts pointing toward you. ☐
6. Just to the left of the three sockets that are close together you will find a large round hole with no copper ring around it. Look for this large round hole. ☐



7. Near the large round hole with no copper ring, you will find two large holes surrounded by copper and connected together by a copper strip. Find the two holes and the copper strip. ☐
8. Around the hole with no copper ring you will also find five slots shaped like this: ▮. The slots are surrounded by copper. Find them. ☐

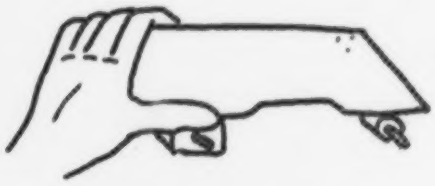


9. The holes and slots you just located are going to hold the IF Transformer. Pick up the IF Transformer from the Parts Sheet. ☐
10. Look at the brown bottom of the IF transformer. Along the outside edge there are two pointed, bent metal prongs. Inspect also the 5 straight prongs and the center post. ☐
11. Look closely at the 5 straight prongs. Use the screw driver to straighten any of them that look bent. If you use the screw driver to straighten the prongs, put it back near the Parts Sheet. ☐

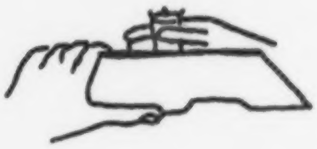


12. Hold the IF Transformer in your right hand, with the brown bottom straight up in the air. Now do the next 14 items all the way to Item 26, without bothering to check each circle until you have completed all 14 of the items. ○

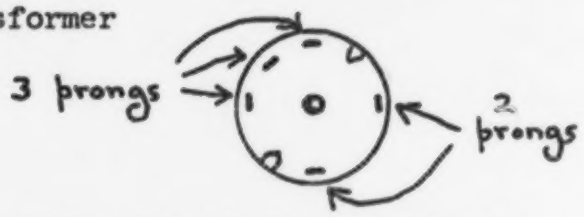
13. With your left hand, lift the circuit board off of the yellow box. Hold it in your left hand with the copper strips up in the air, in the same position it was in when it rested on top of the yellow box. ○



14. Hold the IF Transformer beside the board like this: ○



15. Look at the 5 small prongs. Turn the IF Transformer so the small prongs are in this position: ○



16. Now put the IF Transformer under the circuit board and look down on the top of the circuit board at the 3 large holes for the center post and two large prongs. ○

17. Guide the two large prongs into their holes and push gently on the IF Transformer so the prongs start into their holes. ○

18. Now tilt the circuit board backwards so you can see the underside of the board and the 5 small prongs of the IF Transformer. Turn the board around as much as necessary and see if the 5 small prongs are lined with their 5 holes. ○

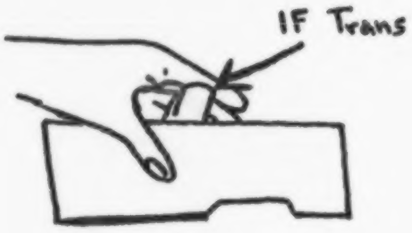
19. If it is necessary to straighten or guide any of the small prongs, let go of the circuit board with your left hand and pick up the screw driver and use it to guide the small prongs toward their holes. Then lay the screw driver down on the table again. ○

20. Take hold of the circuit board with your left hand as before. Push gently on the circuit board with your left hand and push the IF Transformer gently against the circuit board with your right hand until the 2 large prongs, and the 5 small prongs come through their holes and the 2 large prongs hold the IF Transformer in place. ○

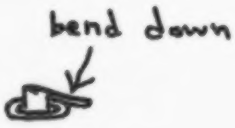
21. Turn the circuit board over and look and see that the IF Transformer rests flat and tight against the circuit board. If it doesn't fit tight against the board, push on it until it does. ○

22. Turn the circuit board over again so the components are underneath and count and be sure all 5 small prongs came through the circuit board. If they did all come through, go on to the next item. If they did not all come through, pull the IF Transformer off the board, straighten any small prong that was bent and go back to Item 14 and do Items 14 to 22 over again. ○

23. With one hand hold the top of the IF Transformer and hold it tight against the circuit board. Hold the board and IF Transformer like this: ○



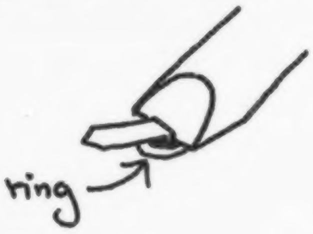
24. Pick up the screw driver with your right hand and use the tip of the screw driver to bend the two large prongs over toward the center post. Press them as flat against the circuit board as you can. ○



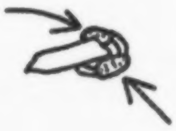
25. Do not bend over the 5 straight prongs. Look to be sure you have bent over the two pointed bent prongs as far as you can, then lay the screw driver near the Parts Sheet. ○

26. Lay the circuit board across the top of the yellow box exactly as it was before, with the volume control on your right. Go back and check all circles of the items you just did. Check the circle for each item as you do it from here on. ○

27. Now pick up the soldering iron with your right hand and the solder in your left hand. Hold the soldering iron against one of the two large prongs, and against the copper ring around the prong. ○



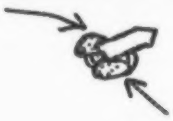
28. After 10 or 20 seconds hold the solder against the connection and let two or three drops flow onto the connection at both the points shown in this drawing. Hold the soldering iron against the connection until the solder flows smoothly onto both the copper ring and and metal prong. ○



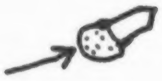
29. Continue to hold the soldering iron against both the prong and the copper ring until the solder flows smoothly onto both the prong and the copper ring. ○

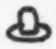
30. Remove the soldering iron tip from the connection and hold it against the other pointed bent prong and against the copper ring around the prong. ○

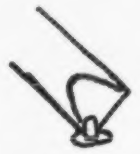
31. After about 10 seconds hold the tip of the solder against the connection and put about two drops of solder on the connection at both points indicated in this drawing. ○



32. Continue to hold the soldering iron against both the prong and the copper ring. Put two or three drops of solder at the back of the prong on the connection where indicated by the arrow. ○



33. Remove the soldering iron and put one corner of the tip against one of the 5 smaller prongs of the IF Transformer. The 5 smaller prongs are shaped like this:  ☐



34. Heat the prong and copper ring and add one drop of solder. Add one drop to the other side of the prong so the prong has solder all around it. ☐

35. Solder the second of the 5 prongs. First heat the connection, add two drops of solder and completely surround the prong. When the solder flows onto prong and copper, remove the iron. ☐

36. Solder the third of the 5 prongs. Heat first, then add solder, surround the prong, remove the iron. ☐

37. Solder the fourth of the 5 prongs. ☐

38. Solder the fifth of the 5 prongs. ☐

39. Put the soldering iron back on its stand and lay the solder on the table near the Parts Sheet. Inspect the 2 large prongs and the 5 small straight prongs. Count and be sure you soldered all 5 straight prongs. ☐

40. See if the solder is shiny and has flowed smoothly onto each prong and onto each copper ring. If not, re-heat and add more solder if necessary. ☐

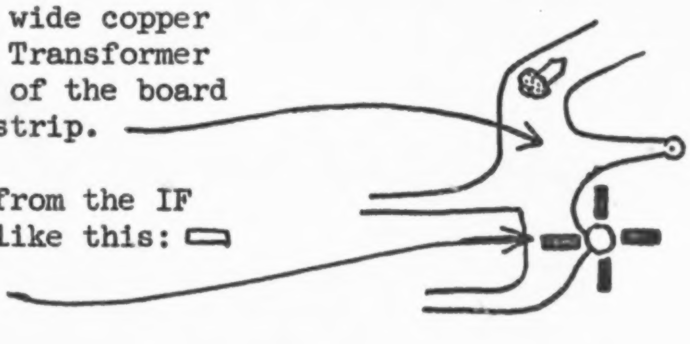
41. Compare the 5 small prongs and the volume control connections. See if the 5 prongs are surrounded by solder the same way the volume control connections are. If not, re-heat and add more solder. ☐

42. Look closely at all seven prongs of the IF Transformer to be sure you have not put on too much solder and caused a short circuit. If you have, shake surplus solder off of the soldering iron and touch it to the short circuit and remove the excess solder, then put the soldering iron back on its stand. ☐

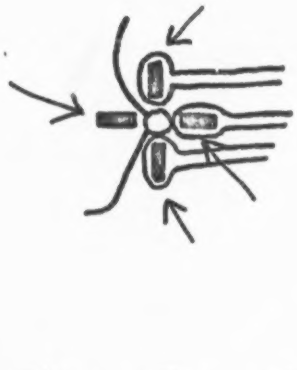
43. Now take the small metal can off of the Parts Sheet. Look at the brown bottom of the can. It has four straight prongs. Hold the can in your right hand and put your right index finger on the prong that is longer than the other three. ☐

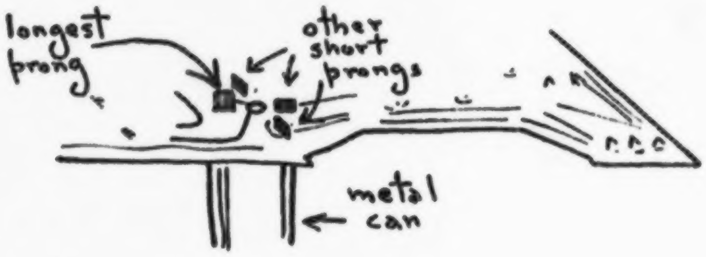
44. Look closely at the circuit board. The wide copper strip that the pointed prongs of the IF Transformer are soldered to extends toward the edge of the board closest to you. Find this wide copper strip. ☐

45. On the wide copper strip about an inch from the IF Transformer prong you will find a slot like this: ▭ Find the slot on the circuit board. ☐

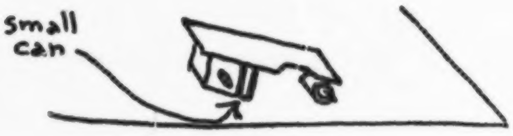


46. The longest prong of the metal can you are holding goes through this slot in the wide copper strip. The other prongs go through the other three slots. Find all four slots. ☐





47. Remove the circuit board from the yellow box. The small metal can must sit beside the IF Transformer. Put the prongs of the metal can up through the circuit board with the longest prong through the slot in the wide copper strip. ☐



48. Hold the circuit board with components underneath. With other hand, hold the small metal can by its sides tight against the circuit board. Push the yellow box aside, out of your way. Lay the board and components on the table so it rests on the IF Transformer, and on the top of the small metal can so the small can is held in place. Don't worry about the board slanting a bit. ☐

49. Be sure the four prongs of the small metal can are all the way through the circuit board. Jiggle the can to be sure the prongs are all the way through the board, and let the circuit board rest on the small metal can so the prongs are held completely through the board. ☐

50. Pick up the soldering iron and the solder. Hold the tip of the soldering iron against the copper strip right beside the longest metal prong, but do not touch the metal prong. ☐

51. After about 10 seconds put 5 or 6 large drops of solder onto the copper strip all the way around the longest prong. Continue to hold the soldering iron in place until the solder flows onto the copper strip. Do not touch the longest prong with solder or soldering iron yet. ☐

52. Now put the soldering iron against the longest prong and hold it there. Do not let the soldering iron touch the copper strip this time. ☐

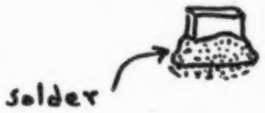
53. After about 10 seconds, put two or three drops of solder onto the prong. Continue to hold the soldering iron against the prong until the solder flows onto the prong. ☐

54. When the solder flows onto the prong, remove the soldering iron from the prong and immediately hold the soldering iron against the solder that is on the copper strip. ☐

55. When the solder on the copper strip begins to melt, push the solder up against the prong, piling up the solder all the way around the prong. ☐

56. Put the soldering iron back on its stand and put the solder on the table near the Parts Sheet. ☐

57. Inspect the connection you just made. See if it looks like this drawing. If it looks like this drawing, go on to the next item. If it does not look like this drawing, go back and repeat 50 to 57. ☐



58. Pick up the soldering iron and the solder. Hold the soldering iron against the copper strip around one of the shorter prongs of the small metal can. You may turn the box if necessary when soldering any of these connections. ☐

59. Add solder to the copper strip all around the prong. ☐

60. Now hold the soldering iron against the prong for about 10 seconds, then add solder to the prong. Continue to hold the soldering iron against the prong until solder flows onto the prong, then take the soldering iron away from the prong. ☐

61. Use the tip of the soldering iron to push the solder on the copper strip against the prong. Hold the soldering iron against the connection until the solder flows against the prong and the copper strip. ☐

62. Inspect the prong. See that solder has flowed onto both the prong and the copper strip. ☐

63. Look at another short prong. Go back to Item 58 and solder this prong in the same way. ☐

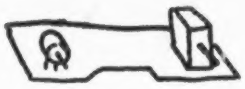
64. Look at the last short prong. Go back to Item 58 and solder this last prong in the same way. ☐

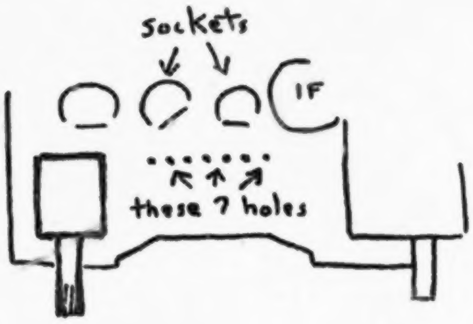
65. Put the soldering iron back on its stand, and lay the solder near the Parts Sheet. ☐

66. Look closely at all prongs of the small metal can. They should look like the volume control connections. If they do not, use the tip of the soldering iron to push the solder up against the connections. ☐

67. Now pick up the flat brown block from the Parts Sheet. The block has printed on it "CR 150" and it has 7 short wires. Straighten the 7 wires. Put the block down on the table, beside the circuit board. ☐

68. Turn the circuit board over so the copper strips are flat on the table and so the volume control is on your left. ☐





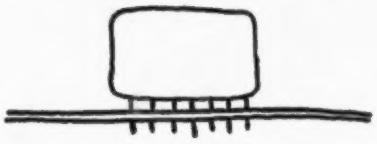
69. There is a piece cut out of the edge of the circuit board between the volume control and the tuner capacitor. Between the cut out and the three sockets there is a row of 7 holes in a straight line. Find the row of holes. ☐

70. Turn the CR block so the printed "CR 150" and the numbers face away from you. Insert the 7 wires from the block into the row of 7 holes. Use the screw driver to guide the wires into the holes, if necessary. ☐

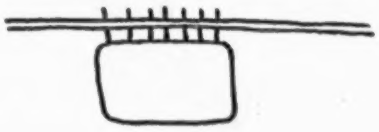
71. Push on the block until all 7 wires have gone through the block. ☐

72. Look at the position of the block. You should not be able to see the printing on the block because the printing should be on the side of the block closest to the sockets, and facing away from you. ☐

73. Pick up the circuit board and adjust the CR block so the wires stick out of the bottom of the board about this far; keeping the block standing straight up in the air. ☐



74. Put the circuit board back on the yellow box as it was before, components hanging down and the volume control on the right. Adjust the position of the CR block so the wires stick through about halfway. ☐



75. Pick up the soldering iron and hold it against the CR block wire to the left of all the others. After 5 seconds add one drop of solder. When the solder flows, add another drop of solder and surround the wire. Remove the iron. ☐

76. Now hold one corner of the soldering iron tip against the wire to the right of all the others. Heat, add two drops of solder and surround the wire. You can turn the box as much as necessary. ☐

77. Solder the 5 middle wires. Do not use too much solder or you will solder in short circuits. Heat first, then surround each wire with solder. ☐

78. Put the soldering iron back on its stand, and put the solder near the Parts Sheet. ☐

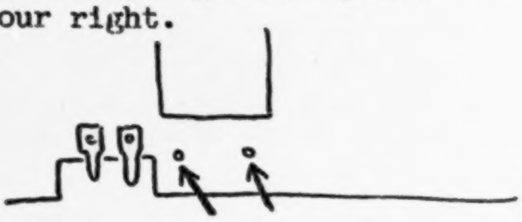
79. Inspect the seven CR block connections and be sure that each wire connection looks like the volume control connections. ☐

80. Count and then look at each of the 7 connections of the CR block wires. Look to see if solder has flowed from any one CR block wire to the CR block wire next to it. If it has, you have a short circuit. Use the soldering iron to remove the excess solder. ☐

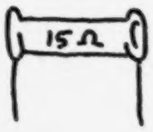
81. Remove the circuit board from the yellow box and lay it on the table in front of you with the components on top and the copper strips underneath the board. ☐

82. Turn the board so the shafts of the volume control and tuner capacitor point away from you. The volume control then will be on your right. ☐

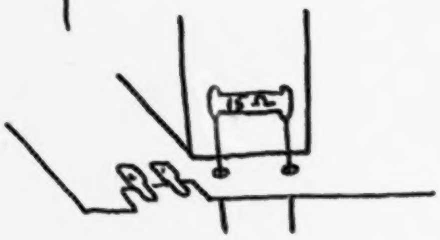
83. Look at the circuit board in the space between the tuner capacitor and the edge closest to you. Look at the two holes in the board. ☐



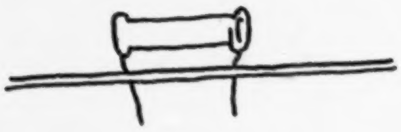
84. Pick up the grey resistor marked 15 Ω. ☐



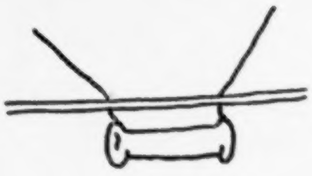
85. Insert the two wires of the 15 ohm resistor into the two holes you just looked at. It doesn't matter which wire goes into either hole. ☐



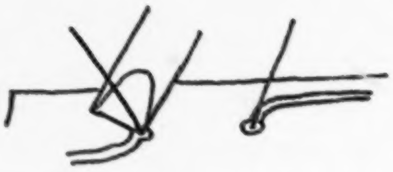
86. Pick up the circuit board and push the 15 ohm resistor down against the circuit board so the two wires go all the way through the holes in the board. Bend the wires a little if necessary. ☐



87. Hold the grey resistor in place with one finger and turn the circuit board upside down and bend the two resistor wires slightly apart until they hold the resistor in place. ☐

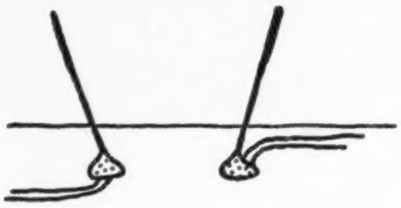


88. Lay the circuit board across the yellow box as it was before. Pick up the soldering iron and the solder, and solder one of the two resistor wires, using the corner of the tip of the iron to heat the connection first, then add two drops of solder. When the solder flows, remove the iron. ☐

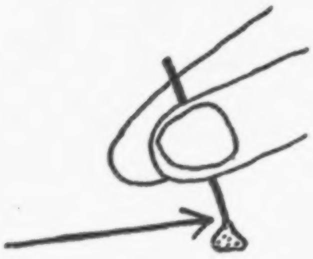


89. Solder the second resistor wire: heat, add two drops of solder, then replace the soldering iron on its stand, and put the solder near the Parts Sheet. ☐

90. Compare the connections you just soldered with the connections of the volume control and the CR block. Look to see that the solder has flowed onto both the wires and the copper rings. If necessary, re-heat and add more solder. ☐



91. There is a pair of wire cutting pliers near the meter. Pick them up, and while holding the tip of the wire with one hand, use the wire cutters to cut off the two wires here:

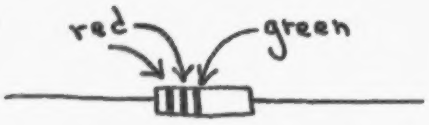


☐

2. Throw away the two pieces of wire you just cut off, and place the pliers near the Parts Sheet. ☐

3. Take the circuit board off of the box and lay it on the table with the volume control on your left and the tuner capacitor on your right. ☐

4. From the Parts Sheet pick up the resistor with the red - red - green stripes. Look closely at the resistor and be sure you have picked up the resistor with the red - red - green stripes.



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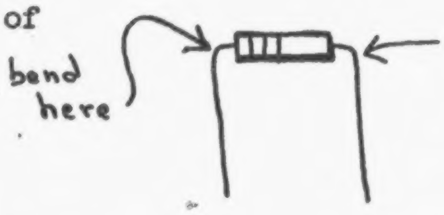
5. With your hands, bend the wire on each end of the resistor like this:



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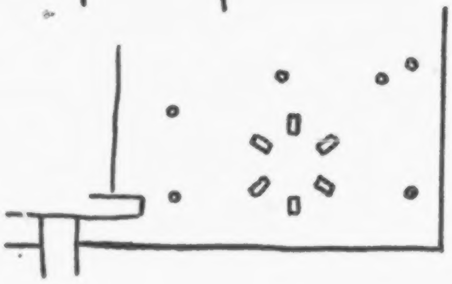
6. Hold the resistor in your left hand. In the right hand corner of the board closest to you, you will find six slots arranged in a circle. Look at the 6 slots and at the small holes near the slots.



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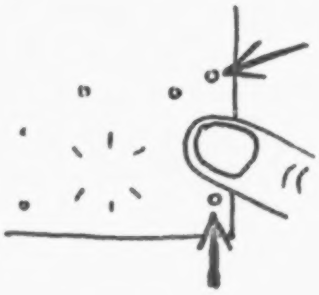
7. Near the six slots there are two holes along the right hand edge of the board. Put your right index finger near the two holes and hold it there.



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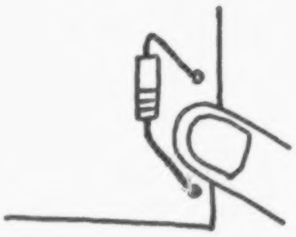
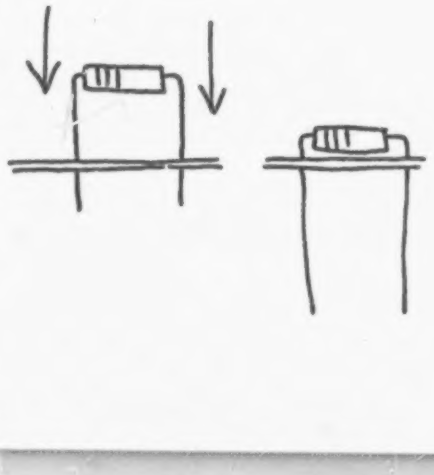
. Now with your left hand put the two wires of the red - red - green resistor into the two holes beside your finger. It doesn't matter which wire goes into which of the two holes.



☐

. Pick up the circuit board and push the resistor down close to the board so the two resistor wires go all the way through the board.



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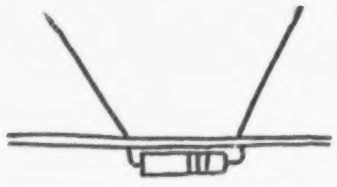
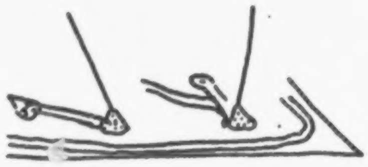
100. Hold the resistor in place with one finger and turn the board over. Bend the wires slightly apart to hold the resistor in place. ☐



101. Put the board on top of the yellow box as before. Pick up the solder and the soldering iron and use one corner of the tip to solder one of the resistor wires: heat, add two drops of solder. When the solder flows, remove the iron. ☐

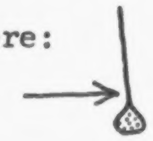
102. Solder the second wire: heat, add two drops of solder. When the solder flows onto both the wire and the copper ring, remove the soldering iron and replace it on its stand, and put the solder near the Parts Sheet. ☐

103. Compare the two connections with the volume control connection. Re-heat and add more solder if necessary. Look carefully to be sure you have not soldered a short circuit between copper strips. If you have, remove it with the soldering iron tip. ☐



104. CAUTION: Check to be sure the wires have cooled before doing the next item. ☐

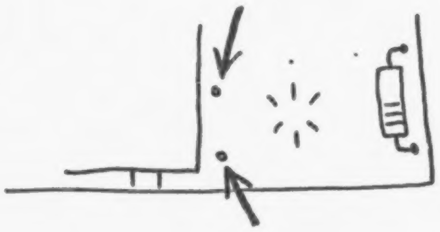
105. Pick up the wire cutter pliers, hold each wire, and cut off the wires here: Put the two pieces of cut off wire on the Parts Sheet beside the two remaining resistors and near the spot where you wrote 15 ohms. ☐



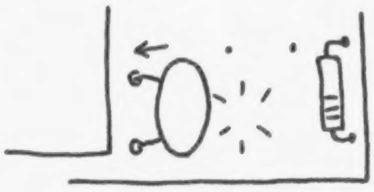
106. Now pick up the largest green wafer capacitor. Compare its size with the other two green wafer capacitors. Be sure that you have the largest in size. ☐

107. Lay the capacitor on the table. Take the circuit board off of the yellow box and place it on the table beside the green capacitor, with the volume control on your left and on the top side of the board. ☐

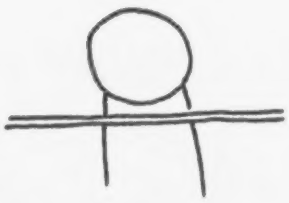
108. The resistor that you just soldered was next to the 6 slots in the front right hand corner of the board. Look at the board just to the left of the 6 slots and find 2 holes close to the tuning capacitor. ☐



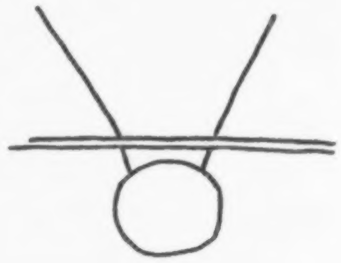
109. The largest green wafer capacitor is to be inserted into the holes you just found to the left of the 6 slots. Pick up the capacitor and insert its wires into these 2 holes. Either wire can go into either of these two holes. ☐



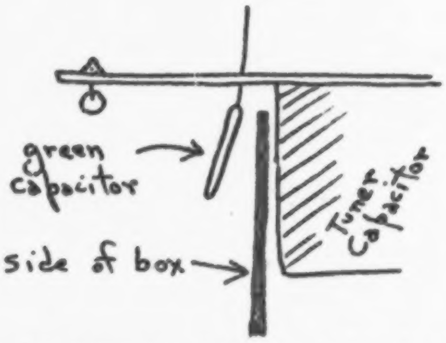
110. Pick up the circuit board in one hand and push the capacitor down close to the board about this close: ☐



111. Hold the capacitor in place with one finger and turn the board over. Bend the two capacitor wires slightly apart to hold the capacitor in place. ☐



112. Carefully put the circuit board onto the yellow box as it was before, but BE CAREFUL, and look to see that the green wafer capacitor is outside the box like this: ☐

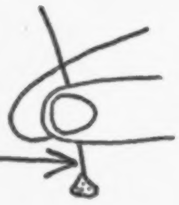


113. Pick up the solder and the soldering iron. Use one corner of the tip to heat one capacitor connection, add two drops of solder. When the solder flows onto the wire and the copper ring, remove the soldering iron. ☐

114. Heat and solder the second capacitor wire. Return the soldering iron to its stand, and the solder to its place near the Parts Sheet. ☐

115. Look closely at the two capacitor connections. Re-heat and add more solder if the connections are not shiny with solder having flowed onto the wires and the copper rings. ☐

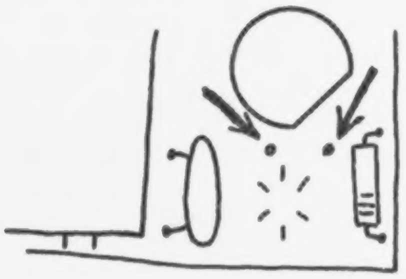
116. Check and see when the wires have cooled. Then hold the wires and pick up the wire cutter pliers and cut off the capacitor wires here:
Put the pliers back on the table near the Parts Sheet, and discard these cut-off pieces of wire. ☐



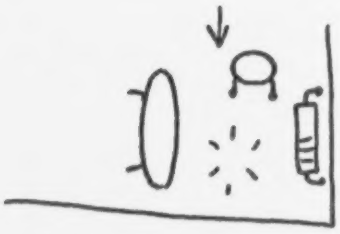
117. Now pick up the smallest green wafer capacitor. Look at it closely; it says 50 PF. Lay the capacitor on the table. ☐

118. Pick up the circuit board, turn it over and put it on the table beside the capacitor, with the components on top of the board and the volume control on the left. ☐

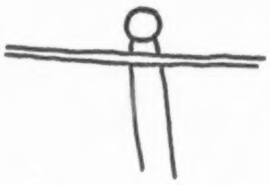
119. To the right of the 6 slots is a resistor, and to the left of the 6 slots is the large green capacitor. Look at the two holes between the 6 slots and the socket. ☐



120. The two holes are very close to the 6 slots. Pick up the smallest green wafer capacitor and put the wires of the capacitor into these two holes. Either wire can go into either hole. Be sure you have the correct two holes. ☐

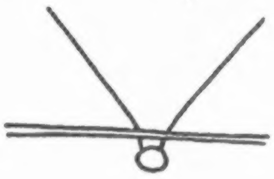


121. Pick up the circuit board in one hand, and push the capacitor down close to the circuit board like this:



☐

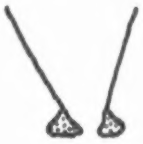
122. Hold the capacitor in place with one hand and turn the board over. Bend the two wires slightly apart to hold the capacitor in place.



☐

123. Carefully put the circuit board back on the yellow box. Be sure to put the side of the box between the tuner capacitor and the large green wafer capacitor. ☐

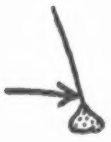
124. Pick up the solder and the soldering iron. Use one corner of the tip to heat and then solder one of the two capacitor wires. Look to see that the solder flows smoothly over the wire and the copper ring and surrounds the wire.



☐

125. Heat and solder the second wire. Put the soldering iron back on its stand. ☐

126. When the wires are cool, hold them and pick up the wire cutter pliers and cut off the wires about here. Put the pliers back on the table near the Parts Sheet, and discard the cut-off pieces of wire.

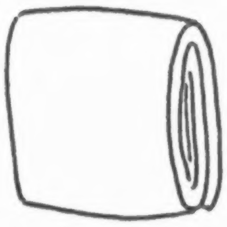


☐

127. Now look closely at the six connections you soldered near the six slots. See if the solder is shiny and flowed smoothly onto each wire and onto each copper ring; if not, re-heat the connection and add more solder, then put the soldering iron back on its stand. ☐

128. Look and see if you have let any solder flow from one copper strip to another, causing a short circuit. If you have, shake any excess solder off of the soldering iron tip and use the tip to remove the short circuit. Then put the soldering iron back on its stand. ☐

129. Get a paper towel or piece of tablet paper, wet it but don't have it dripping water. Fold it into a pad about this size and lay it on the table beside the yellow box.



☐

130. Pick up the soldering iron and wipe the tip of the iron on the wet paper pad until the tip is clean and silvery looking. Replace the soldering iron on its stand and discard the paper pad. ☐

131. Unplug the soldering iron. ☐

132. If you are going to stop now, turn to Page 2 and read the instructions that appear there with the title "Instructions on Putting the Kit Away When You Stop". If you are going to continue on to Unit D immediately, turn the page and begin, after you take a 10 minute rest. ☐

END OF UNIT C

PRECEDING PAGE BLANK- NOT FILMED

READ EACH ITEM COMPLETELY, ALL THE WAY TO THE END OF THAT ITEM, AND THEN DO EVERYTHING THE ITEM TELLS YOU TO DO.

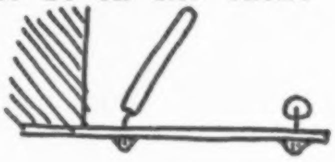
RADIO UNIT D

1. If you continued on to this Unit without stopping, go on to the next item. If you did stop, take the Parts Sheet out of the yellow box and arrange all the parts on it, and put the soldering iron and stand over to your right. ☐

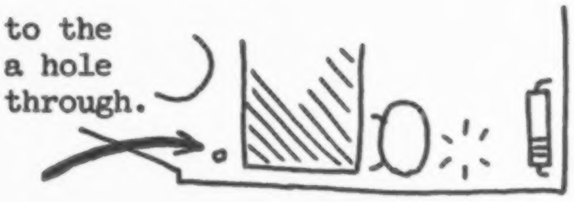
2. Be sure the soldering iron is resting on its stand. Plug the iron into an electrical outlet. ☐

3. Put the coil of solder and the wire cutter pliers near the Parts Sheet. ☐

4. Turn the circuit board so the components are on top and put it on the table with volume control to your left. Bend the large green wafer capacitor slightly away from the tuner capacitor. ☐

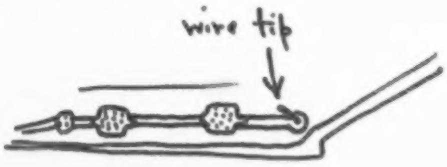


5. On the edge of the board closest to you, next to the tuning capacitor and small metal can there is a hole slightly larger than the last 6 you put wires through. Find this hole. ☐

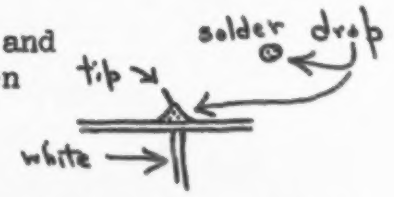


6. Pick up the white wire from the Parts Sheet. Put one end of the wire down into the hole next to the tuner capacitor and small metal can. ☐

7. Hold the white wire in place with one finger. Pick up the board, turn it over and put it back on the yellow box with the volume control on your right. Bend the tip of the white wire slightly toward the large soldered connections of the tuning capacitor. ☐

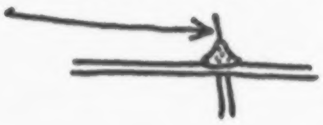


8. Pick up the soldering iron and hold it against the wire and the copper ring, wait for the connection to heat and then add one drop of solder to the connection. ☐



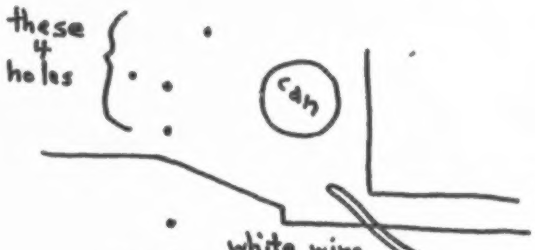
9. When the drop of solder flows onto both the copper ring and the wire, add a second drop of solder. Add enough solder so the wire is surrounded by solder, then put the soldering iron back on its stand. ☐

10. Pick up the wire cutters, hold the wire with your other hand and cut off the tip of the wire above the solder connection: Put the wire cutters back on the table and then check to see that you have not soldered in a short circuit. ☐

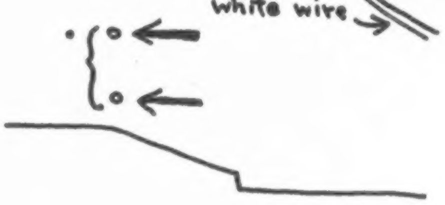


11. Pick up the board and put it on the table with the volume control on your left and on top of the board as before. ☐

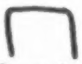
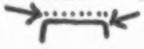
12. Just to the left of the small metal can there are four holes. Count them and be sure you have found four holes close to the small metal can. ☐



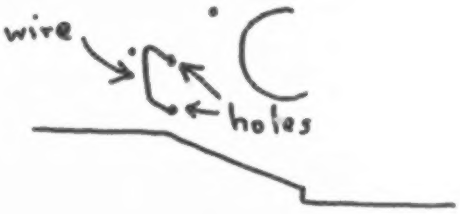
13. Two of the holes point toward the edge nearest you. Look at these two holes. ☐

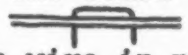


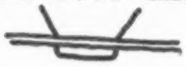
14. From the Parts Sheet pick up one of the bare wires that you cut off of the red - red - green resistor. You laid them near the spot where the grey 15 ohm resistor used to be on the Parts Sheet. ☐

15. With your hands, bend the wire like this:  , so the part of the wire between the bends, this part,  , is about as long as the distance between the two holes you just looked at. ☐

16. Now insert the ends of the wire into those two holes. ☐

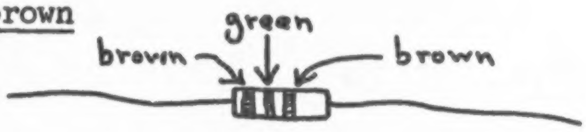


17. Pick up the board with one hand and push the wire down flat against the board,  then turn the board over and bend the ends slightly to hold the wire in place. ☐

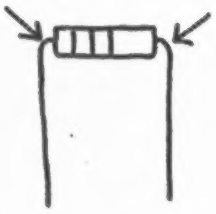


18. Turn the board over again and lay it on the table with the volume control on the left. ☐

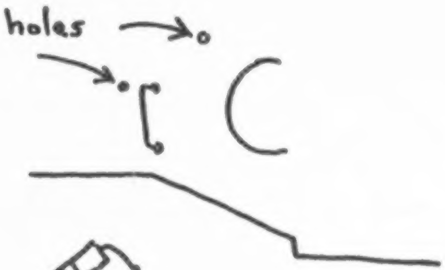
19. Now pick up the light brown - green - light brown striped resistor from the Parts Sheet. Look closely at the stripes and be sure they are light brown - green - light brown. ☐



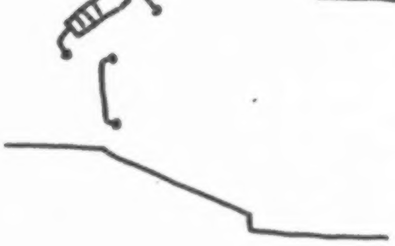
20. Bend the wires on the ends of the resistor like this: ☐



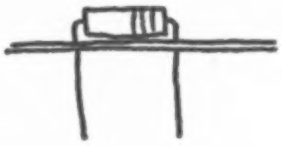
21. Hold the resistor in your hand while you look at the circuit board at the other two holes near the small metal can. ☐



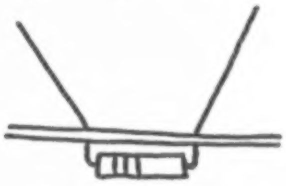
22. Put the wires from the resistor into the two holes you just looked at. Either wire can go into either hole. ☐



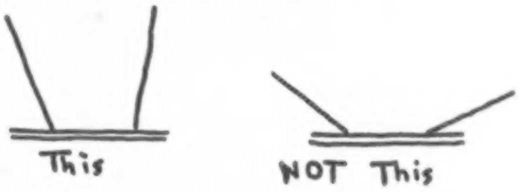
23. Pick up the circuit board and push the reistor down close to the board like this: ☐



24. Hold the resistor in place with one finger while you pick up the circuit board and turn it over. Bend the resistor wires apart slightly to hold the resistor in place. ☐



25. Put the circuit board carefully on top of the yellow box as before, being careful of the large, green wafer capacitor that is next to the tuner capacitor. Bend the ends of the four wires so they are bent only slightly. ☐



26. Pick up the soldering iron. Solder one of the four wires, using one corner of the tip of the iron. Remember to heat, then add one drop of solder, then add a second drop and surround the wires. When the solder flows, remove the soldering iron. ☐

27. Solder a second wire. ☐

28. Solder a third wire. ☐

29. Solder the fourth wire. Put the soldering iron back on its stand. ☐

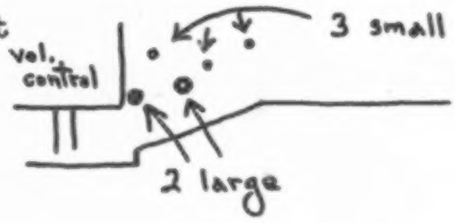
30. Inspect the four soldered connections carefully. Look to see that each wire is surrounded by solder; that the solder is shiny, and has flowed onto each wire and each copper ring. ☐

31. When the wires are cool, hold each one as you cut off the excess wire with the wire cutters. Discard the cut-off wires, and put the wire cutters back on the table. ☐

32. Take the circuit board off of the yellow box, turn it over and put it on the table with the volume control to the left. ☐

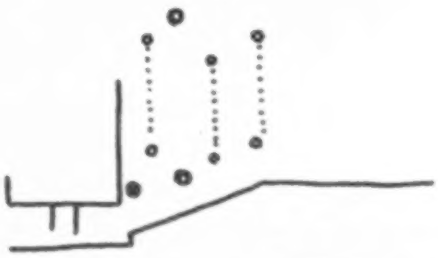
33. In the space between the volume control and the CR block there are 9 holes. Look at the holes and pick out the 6 smaller holes and 3 larger holes. ☐

34. Five of the 9 holes are near the front edge of the board. Find the 2 larger holes and 3 smaller holes near the front edge of the board.



☐

35. Look at the 3 smaller holes that are close to the sockets. See that each smaller hole is directly in back of one of the smaller holes close to the front edge of the board.



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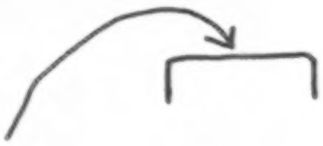
36. From the Parts Sheet in the spot marked 15 ohms, pick up the other piece of bare wire that you cut off of the red - red - green resistor. Bend it so the piece between the bends is about this long.



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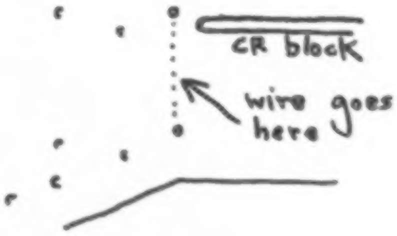
37. This wire goes into the two smaller holes that line up with each other close to the CR block. Put the ends of the wire into these holes.



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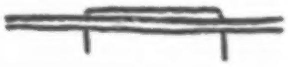
38. Pick up the board and push the wire down against the board.



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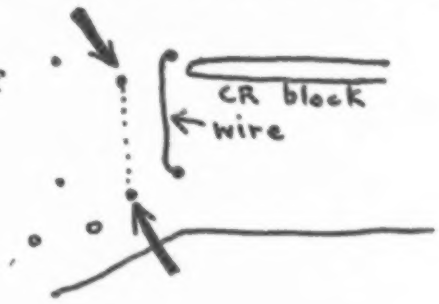
39. Hold the wire in place; turn the board over and bend the ends of the wire slightly apart.

☐

40. Turn the board over again and put it on the table with the volume control on your left. ☐

41. Look at the two small holes just to the left of the wire. Be sure you are looking at the two smaller holes closest to the wire.



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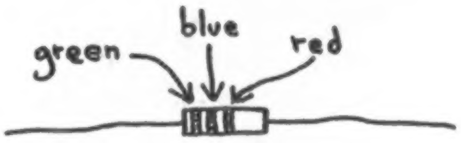
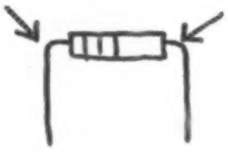
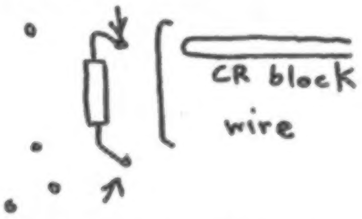
42. From the Parts Sheet pick up the last resistor. Be sure that its stripes are green - blue - red. ☐



43. Bend the wires from the ends of the resistor about like this: ☐

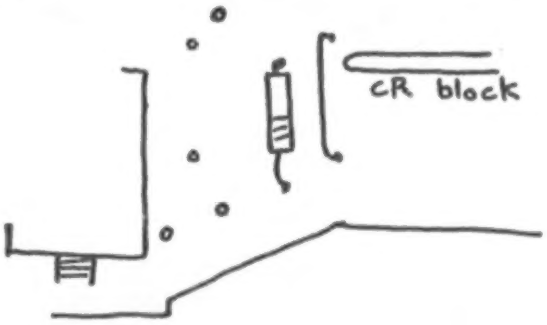


44. Insert the ends of the resistor wires into the two smaller holes closest to the wire. Either resistor wire can go into either hole. ☐



45. Pick up the board with one hand and push the resistor down against the board. While holding the resistor in place, turn the board over and bend the resistor wires slightly apart. Bend the ends of the bare wire again in case they have become bent over too much. ☐

46. Turn the board over again and look at the bare wire and at the resistor. Be sure the board looks like this: ☐



47. Turn the board over and carefully place it on the yellow box, being careful not to harm the large green wafer capacitor that is next to the tuner capacitor. ☐

48. Use one corner of the tip of the iron to solder one of the four wires, turning the box around if necessary. Remember, when soldering, to heat the connection and add one drop of solder; when the solder flows, add another drop of solder and surround the wire. ☐

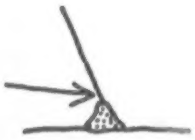
49. Solder another of the four wires. ☐

50. Solder the third wire. ☐

51. Solder the fourth wire. Put the soldering iron back on its stand. ☐

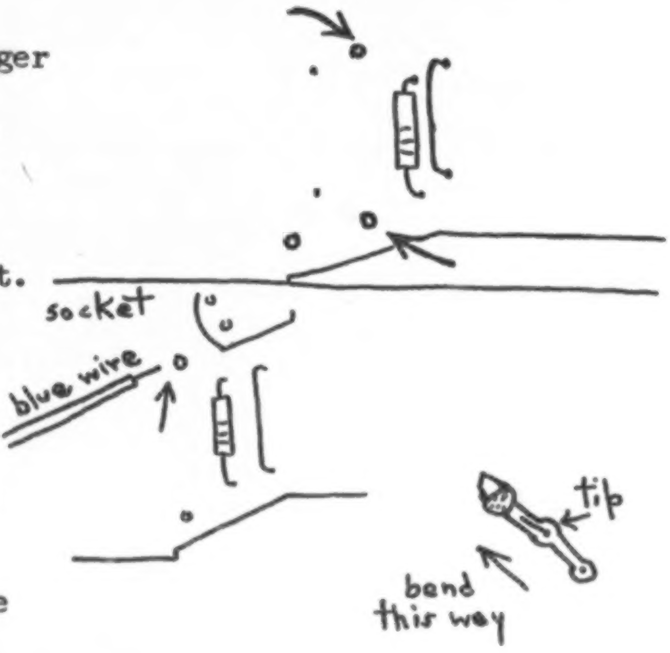
52. Look closely at the 4 connections. Be sure they look like the volume control connections. Be sure there are no short circuits. ☐

53. Pick up the wire cutters and trim off the excess wire. Discard the scraps of wire, and put the wire cutters back on the table. ☐



54. Pick up the circuit board, turn it over and put it on the table with the volume control on the left. ☐

55. There are two smaller holes and three larger holes between the volume control and the green - blue - red resistor. Look at the two larger holes closest to the resistor. ☐



56. Pick up the blue wire from the Parts Sheet. Put one end of this blue wire into the larger hole closest to the resistor and closest to the sockets. Push the tip of the blue wire all the way into the hole. ☐

57. Hold the blue wire in place, and turn the board over and bend the tip of the wire over toward the socket prong that is soldered to the same copper strip that the blue wire sticks through. ☐

58. Put the board on the yellow box. Look and be sure the blue wire is still in place. ☐

59. Pick up the soldering iron and the solder. Heat the end of the blue wire and the copper ring and add one drop of solder to the connection. When the solder flows onto both the wire and the copper ring, add another drop of solder and surround the wire with solder. ☐

60. Put the soldering iron back on its stand. Inspect the connections. Look to see that the solder is shiny and has flowed onto both the wire and the copper ring. ☐

61. Look at the connection and compare it to the volume control connections. If necessary, re-heat the connection and add more solder. ☐

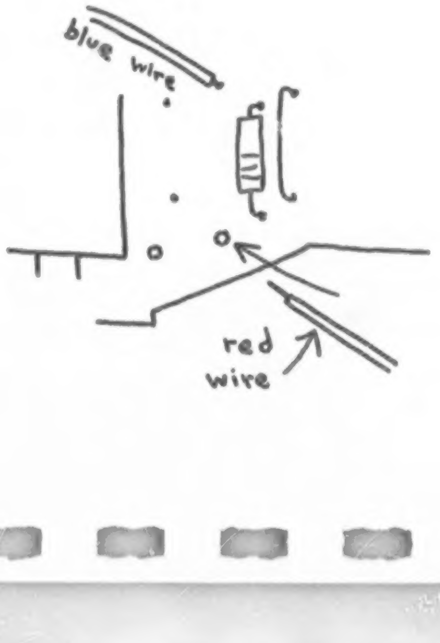
62. Look at the connection and be sure the solder has not flowed across to a different copper strip. If solder has caused a short circuit, remove the excess solder with the soldering iron tip. ☐

63. Pick up the wire cutters and cut off the excess wire. Discard the small scrap of wire, and put the wire cutters back on the table. ☐

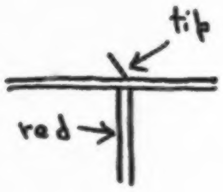
64. Pick up the circuit board, turn it over and place it on the table with the volume control on the left. ☐

65. Pick up the red wire from the Parts Sheet. ☐

66. Look at the blue wire you just soldered. It is close to one end of the green - blue - red resistor. Find the larger hole close to the other end of that resistor and put one end of the red wire into that larger hole. ☐



67. Hold the red wire in place and pick up the circuit board in one hand and turn it over. Bend the end of the red wire slightly to hold it in place. ☐



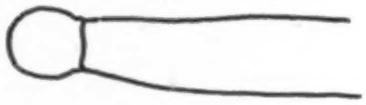
68. Place the circuit board carefully on top of the yellow box as before. Check to see that the red wire is still in place. ☐

69. Pick up the soldering iron and solder the tip of the red wire; be sure to surround the wire with solder. ☐

70. Put the soldering iron back on its stand. Inspect the red wire connection. If it is not satisfactory, re-heat and resolder it. ☐

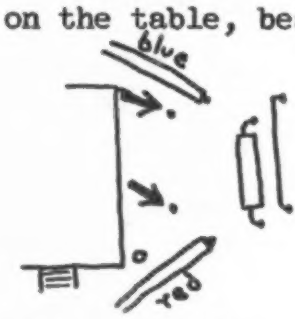
71. Pick up the wire cutters and cut off the excess wire. Put the wire cutters back on the table. ☐

72. Pick the last green wafer capacitor from the Parts Sheet and lay it on the table. ☐



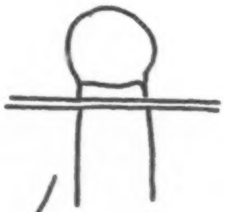
73. Pick up the circuit board, turn it over and put it on the table, beside the green capacitor. ☐

74. Next to the blue and red wires are two smaller holes. Look at them and be sure you are looking at the two smaller holes. ☐

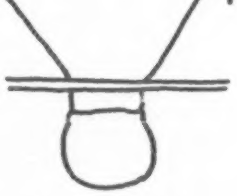


75. Pick up the green capacitor from the table and push the ends of its wires into the two smaller holes. Either wire can go into either hole. ☐

76. Hold the green capacitor in place and pick up the circuit board. Push the capacitor wires on through the circuit board until the capacitor is close to the board. ☐



77. Turn the board over and bend the capacitor wires slightly apart. ☐



78. Put the board carefully on top of the yellow box as before. ☐

79. Pick up the solder and the soldering iron, and use a corner of the tip to solder one of the capacitor wires. ☐

80. Solder the other capacitor wire. Put the soldering iron back on its stand. ☐

81. Inspect the two connections. Resolder if necessary. ☐

82. Look for short circuits near the two connections. If you have made any short circuits, remove the excess solder with the tip of the soldering iron, then put the soldering iron back on its stand. ☐

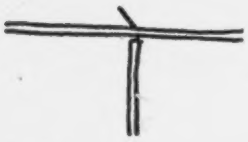
83. Pick up the wire cutters, cut off the excess wire, and put the wire cutters back on the table. Discard the cut-off wires. ☐

84. Pick up the circuit board, turn it over and put it on the table with the volume control on the left. ☐

85. Take the black wire off of the Parts Sheet and hold it in your hand. ☐

86. Between the volume control and the red wire is one larger hole. Look for the hole and insert one end of the black wire into the hole. ☐

87. Hold the black wire in place and pick up the circuit board and turn it over. Bend the tip of the black wire slightly to hold it in place.



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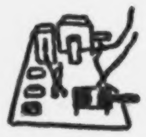
88. Put the circuit board carefully on top of the yellow box as before. ☐

89. Pick up the solder and the soldering iron and heat the connection, turning the box if necessary. Add one drop of solder. When the solder flows add another drop and surround the wire. Put the soldering iron back on its stand. ☐

90. Inspect the connection and resolder if necessary. Use the wire cutters to cut off the excess wire. ☐

91. Look and see if the solder has flowed across to the copper strip near the connection. If it has, there is a short circuit; remove the short circuit with the tip of the soldering iron. ☐

92. Pick up the circuit board, turn it over and put it on the table with volume control toward you and the tuner capacitor at the end of the board away from you.



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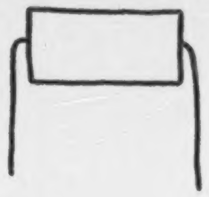
93. Pick up the round white capacitor with a wire sticking out of each end. Look at it; printed on it is one line that says .05 MFD.

☐

2

94. With your hands, bend the wires from the white capacitor like this. Hold the capacitor in your hand.



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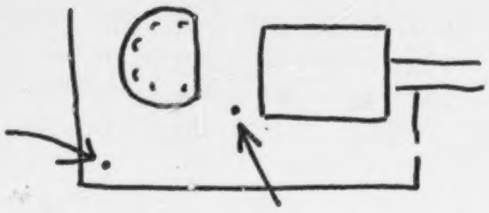
95. At the end of the board closest to you there are 2 small holes; one hole is close to the corner of the board, and the other is close to both the socket and the volume control. Find these two holes.



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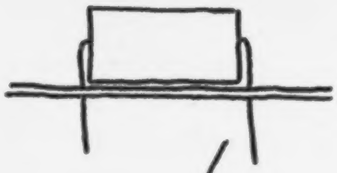
96. Insert the two capacitor wires into the holes you just looked at. Either wire can go into either hole. ☐

97. Pick up the board and push the capacitor down against the circuit board and snug against the side of the socket.



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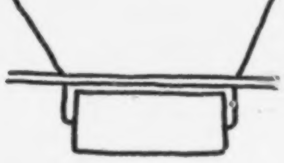
98. Hold the capacitor in place. Turn the board over and bend the capacitor wire slightly apart.



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99. Put the circuit board carefully on the yellow box. The board does not fit as well now as it did before because the white capacitor gets in the way. Don't worry about that. ☐

100. Pick up the solder and the soldering iron and solder the two capacitor wires. Put the soldering iron back on its stand. ☐

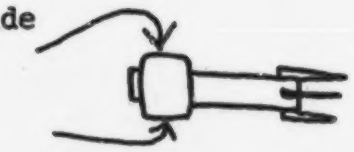
101. Pick up the wire cutters and cut off the excess of both wires and put the wire cutters back on the table near the Parts Sheet. ☐

102. Inspect both the connections and resolder if necessary. ☐

103. Look for short circuits and if you find one, remove it. ☐

104. Pick up the circuit board, turn it over and lay it on the table with volume control on the left. ☐

105. Pick up the OSC coil by touching only the wide coiled part of it, here:



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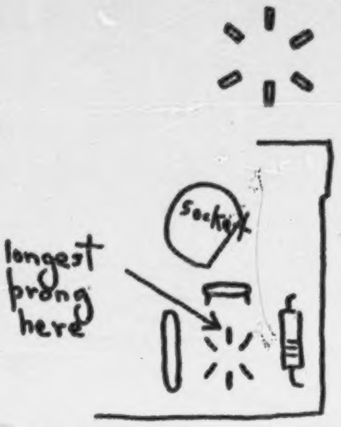
106. Look closely at the six prongs of the OSC coil. Find the prong that is longer than the other 5 prongs. ☐

107. Hold the OSC coil in your right hand. Look at the right hand corner of the circuit board where you put two green capacitors and one resistor. If the largest green capacitor is bent over so far that you cannot see the 6 slots, bend the capacitor straight up. ☐



108. Look at the 6 slots. One of them is closer to the socket than any of the other 5 slots. Put the longest prong of the OSC coil into the slot closest to the socket. ☐

109. Carefully push the 6 prongs of the OSC coil lightly against the 6 slots. If any prong is bent out of line, straighten it, then replace the longest prong into the slot closest to the socket. ☐

110. With your left hand pick up the circuit board. ☐

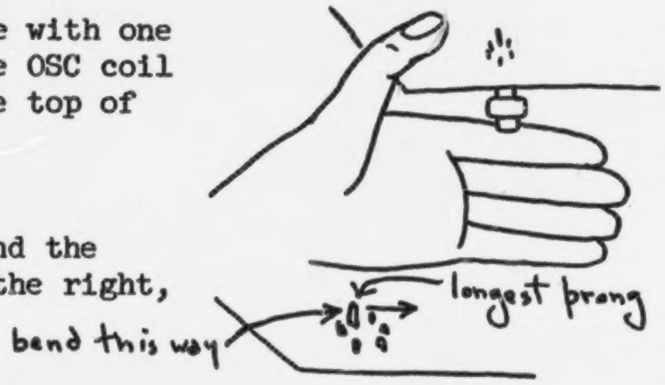
111. Be sure that all prongs are aimed into their slots, and then gently push the prongs of the coil into the slots. ☐

112. Insert the OSC coil into the board until the bottom of the coil just about touches the board and all 6 prongs stick through the other side of the board. ☐

113. Keep one finger of your left hand on the top of the OSC coil and turn the board over, and turn the board so the OSC coil is on the left. ☐

114. Continue to hold the OSC coil in place with one finger of your left hand on top of the OSC coil and the thumb of your left hand on the top of the circuit board. ☐

115. With one finger of your right hand bend the longest prong of the OSC coil toward the right, away from the edge of the board. ☐



116. Bend the longest prong of the OSC coil down flat against the circuit board. This will hold the coil in place, so let go of the coil with your left hand. ☐

117. Lay the circuit board on the table, with the components underneath, so the board rests on the IF Transformer and the volume control. ☐

118. Pick up the soldering iron and use a corner of the tip to solder the longest prong of the OSC coil. Look closely to be sure the solder flows onto the prong and onto the copper ring. Be careful not to use too much solder because the copper rings and copper strips are very close together. Do not solder any short circuits. ☐

119. Solder a second prong of the OSC coil. ☐

120. Solder a third prong of the OSC coil. ☐

121. Solder the fourth prong of the OSC coil. ☐

122. Solder the fifth prong of the OSC coil. ☐

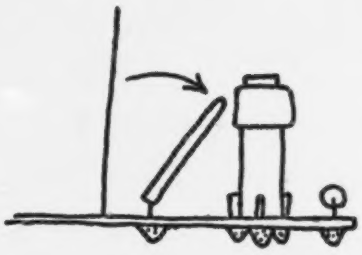
123. Solder the sixth prong of the OSC coil. Put the soldering iron back on its stand. ☐

124. Look closely at all six connections of the OSC coil. Count to be sure you soldered all 6 connections. ☐

125. Look closely to see that solder did not flow from any one prong to any other prong of the OSC coil. If any two prongs of the OSC coil are soldered together you have a short circuit. Use the soldering iron to remove any short circuit, then put the soldering iron back on its stand. ☐

126. Now turn the circuit board over and put it on the table with the volume control on the left. ☐

127. In the corner of the circuit board where you just soldered the OSC coil, bend the large green capacitor toward the OSC coil, until it almost touches the coil.



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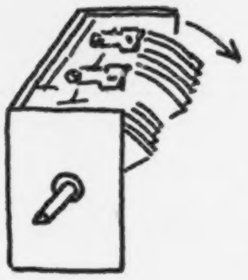
128. Take hold of the shaft of the tuner capacitor and turn it clockwise to the right, ↷. Watch the metal plates of the capacitor as they swing out to the right.



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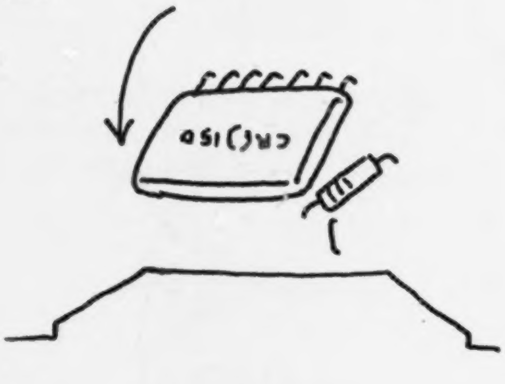
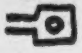
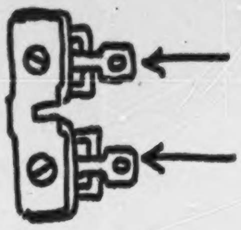
129. Turn the tuning shaft all the way to the right and watch to be sure that the metal plates do not hit the large green capacitor. If necessary, bend the green capacitor closer to the OSC coil. ☐

130. Now turn the tuning shaft all the way to the left, counter clockwise, ↶. Watch the metal plates move inside the tuner capacitor. ☐

131. Take hold of the CR block and pull it toward you so the CR block wires bend. Bend the CR block down until it almost touches the light brown - green - light brown resistor. ☐



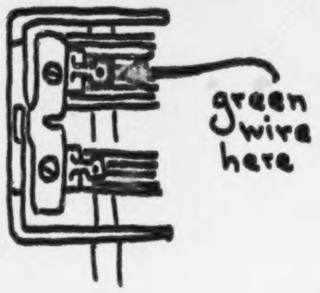
132. **Look at the top of the tuner capacitor. You will see two screws, and sticking out to the right from each screw is a prong shaped like this:**  **Notice the hole in each prong.** ☐



133. **Directly under each of the two prongs you just located, are the metal plates of the variable capacitor. Look at the plates and see that there are fewer plates under the prong closest to the shaft and more plates under the prong furthest from the shaft.** ☐

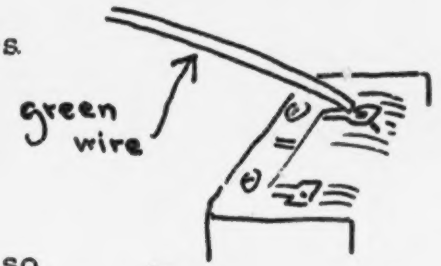
134. **Pick up the green wire from the Parts Sheet.** ☐

135. **Put one end of the green wire down into the hole in the prong that is furthest from the tuning shaft, and above the largest set of metal plates.** ☐

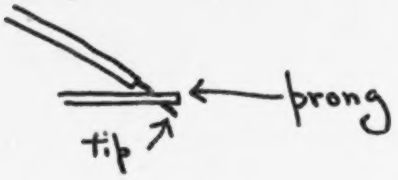


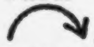
136. Look closely and be sure that you have put the green wire into the prong that has the most metal plates under it. ☐

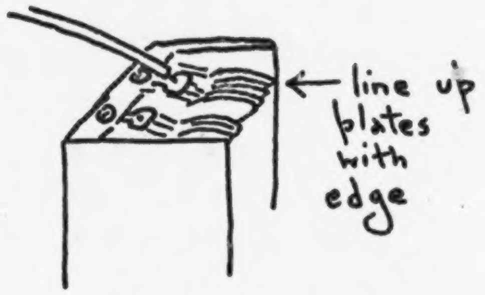
137. Lay the green wire over to the left so it lies in place held by the tip that is through the prong. ☐



138. Pull the green wire out of the hole slightly so that about half of the bare tip of the green wire is through the prong. ☐

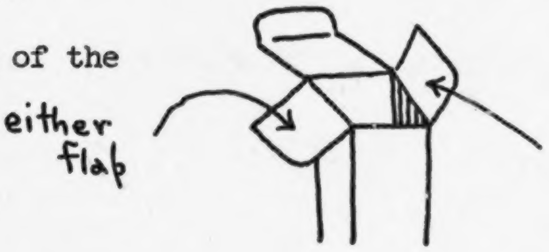


139. Take hold of the tuning shaft. Watch the metal plates and turn the tuning knob slowly clockwise, , until you have moved the metal plates out to the right just enough so the right edge of the plates are lined up even with the right side of the tuner capacitor. Leave the tuner capacitor plates in that position. ☐



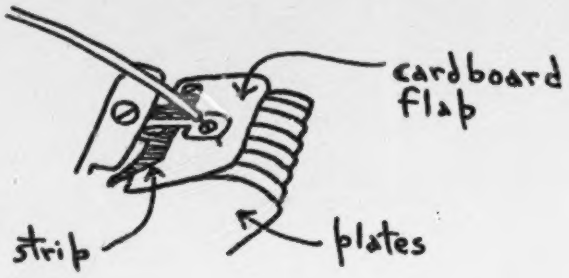
140. The yellow box contains the small white box that held the small metal [illegible]an. Take the small white box out of the yellow box. ☐

141. Open one end of the box and tear off one of the cardboard flaps. ☐



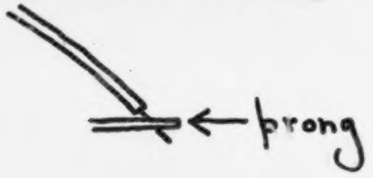
142. Hold the cardboard flap that you just tore from the white box, and discard the white box. ☐

143. Lay the cardboard flap on top of the metal plates, under the prong that holds the green wire. Push the flap under the metal strip that is under the prong. ☐



144. The cardboard flap is to protect the metal plates in case you accidentally use too much solder and let it drip off of the prong. Check the cardboard flap again and be sure it is completely under the hole in the prong and covering the metal plates. ☐

145. Check the green wire again and adjust its position if necessary so that half of the tip is through the hole in the prong. ☐



146. Read the next three steps now, then come back to this item and do the steps one at a time. ☐

147. Pick up the soldering iron and hold it on top of the prong and be sure it touches both the prong and the green wire. ☐

148. Add one drop of solder to the connection. When it flows onto the wire and the prong, add another drop. ☐

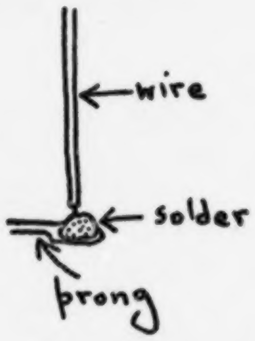
149. Touch the tip of the solder to the half of the wire that is under the hole in the prong and to the underside of the prong at the same time. Put one drop of solder onto the underside of the connection. ☐

150. If the hole in the prong is not completely covered with solder move the soldering iron tip slightly back and forth on the underside of the prong until solder covers the hole. If necessary, add one more drop of solder to the top of the prong. ☐

151. Remove the soldering iron tip carefully from the prong and put the soldering iron back on its stand. CAUTION: do not bump the circuit board. ☐

152. Do not touch the green wire yet. Do not remove the cardboard flap. Blow gently on the connection. ☐

151. Take hold of the green wire and gently bend it straight up from the prong. ☐



152. Look closely at the connection. See if the solder is shiny and has flowed onto both the wire and prong. If not, re-heat the connection until solder flows onto both the wire and the prong. ☐

153. Now remove the cardboard flap that is lying under the connection and discard it. ☐

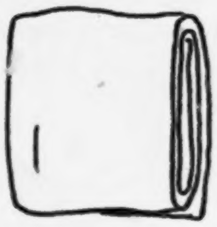
154. Watch the tip of the green wire that is below the prong as you slowly turn the tuner shaft back and forth. ☐

155. If the metal plates hit the tip of the wire, turn the tuner shaft all the way to the right, clockwise ↻ ; and cut off the tip of the wire with the wire cutters. If the plates do not hit the tip, do not cut the tip. Pick out the cut tip of the wire and discard it, and put the wire cutters back on the table near the Parts Sheet. ☐

156. Turn the shaft of the tuner capacitor all the way to the left, counter-clockwise ↺. ☐

157. Put the circuit board near the Parts Sheet and put the yellow box near the radio case. ☐

158. Get a paper towel or piece of tablet paper, wet it but don't have it dripping water. Fold it into a pad about this size and lay it on the table beside the yellow box. ☐



159. Pick up the soldering iron and wipe the tip of the iron on the wet paper pad until the tip is clean and silvery looking. Replace the soldering iron on its stand and discard the paper pad. ☐

160. Unplug the soldering iron. ☐

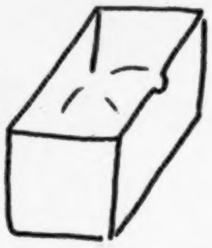
161. If you are going to stop now, turn to Page 2 and read the instructions that appear there with the title "Instructions on Putting the Kit Away When You Stop". If you are going to continue on to Unit E immediately, turn the page and begin, after you take a 10 minute rest. ☐

END OF UNIT D

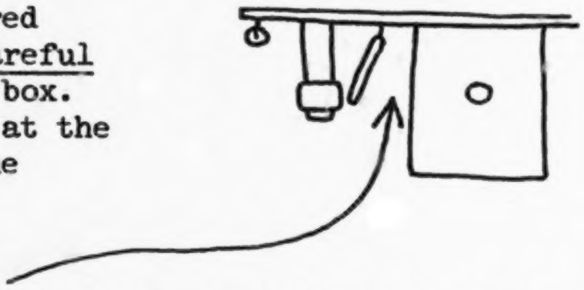
READ EACH ITEM COMPLETELY, ALL THE WAY TO THE END OF THAT ITEM, AND THEN DO EVERYTHING THE ITEM TELLS YOU TO DO.

RADIO UNIT E

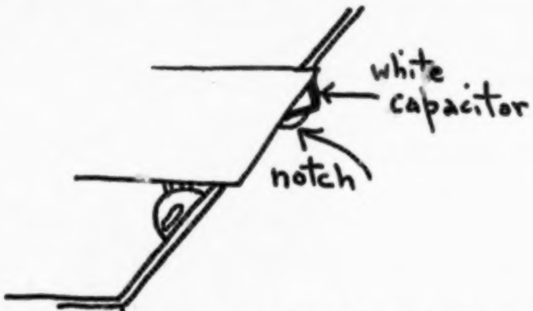
1. If you continued on to this Unit without stopping, go on to the next item. If you did stop, take the Parts Sheet out of the yellow box and arrange all the parts on it, and put the soldering iron and stand over to your right. ☐
2. Put the circuit board near the Parts Sheet. ☐
3. Put the yellow box in front of you, do not remove anything from it. One side of the box has a small notch cut out of it. Find the notch and turn that side of the box to the right. ☐



4. Pick up the circuit board and turn it over so the components are underneath. Turn the board so the volume control is on the right and the tuner shaft and volume control shaft point toward you. Hold the circuit board in your hand and do not put it on the table. ☐
5. Now that the components have been soldered to the circuit board you must be very careful about placing the board onto the yellow box. Look at the left underside of the board at the space between the tuner capacitor and the large green wafer capacitor. ☐



6. The left side of the box must be between the tuner capacitor and the green wafer capacitor. Carefully put the circuit board on the yellow box, and be sure the left side is against the tuner capacitor and not against the OSC coil. ☐
7. The white capacitor next to the volume control keeps the right side of the circuit board from lying flat on the box. Slide the board along the top of the yellow box toward the notch in the right side of the box, until the white capacitor fits into the notch in the box. ☐



8. Look on the circuit board and you will find only 2 holes near socket D that do not have wires through them. Find the 2 holes. No connection is to be soldered on them. ☐
9. Every soldered connection must now be inspected. Look closely at each connection and be sure that every connection has been soldered. ☐

10. If you find any connection that doesn't look as good as the connections of the volume control, you should resolder that connection. If you find any poor connections, skip to Item 1, Unit H; if not, go on to the next item. ☐

11. Now look closely for short circuits. If you cannot tell whether two points that are connected by solder actually should be or not, or if you find any short circuits, turn to Item 13, Unit H; otherwise go on to the next item. ☐

12. Put these instructions to the right of the yellow box. Put the meter and its leads to the left of the yellow box. ☐

13. Plug the short handle of the red lead into the hole marked +, and the short handle of the black lead into the hole marked -. ☐

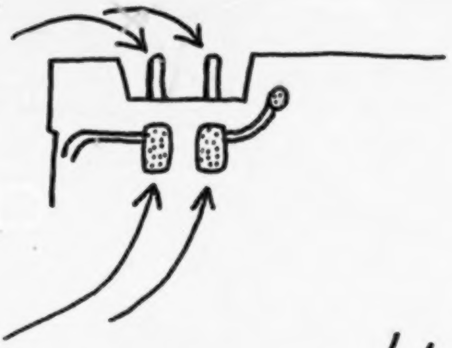
14. Turn the dial of the meter to $\overset{RX10}{\Omega}$. Be sure it says $\overset{RX10}{\Omega}$, not $\overset{RX1}{K\Omega}$. ☐

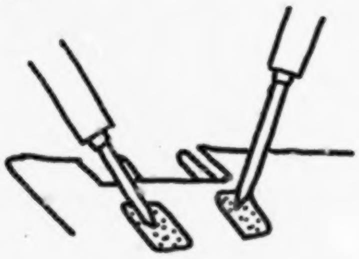
15. Untwist the wire leads if necessary and touch the tips of the leads together. ☐

16. Hold the metal tips of the leads together with your right hand, and at the same time adjust the black knob on the meter with your left hand so the red hand of the meter points exactly at 0 ohms, then lay the two leads on the table beside the meter. ☐

17. In the upper left hand corner of the circuit board there are two large metal prongs. Locate and look at the two prongs. ☐

18. Look at the two large soldered connections on the circuit board above each of the two prongs. ☐



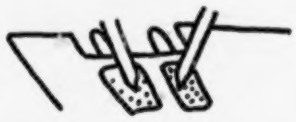


19. Pick up the large handles of the red and black leads. Hold one lead in each hand, and touch one lead to each of the two large soldered connections above the two prongs you just looked at. ☐

20. The meter hand should not move. Turn the dial setting to $\overset{RX1}{K\Omega}$, and again touch the leads to the two large soldered connections. The meter hand still should not move. Put the leads on the table beside the meter. ☐

21. If the meter hand did not move, skip items 21a, 21b and 21c and go to item number 22. If the meter hand did move, go on to item 21a. ☐

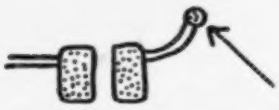
    21a. Pick up the meter leads again. Touch one lead to each of the two large soldered connections above the two prongs. ☐



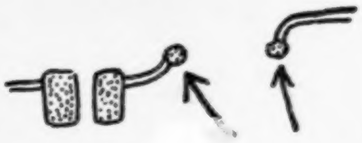
21b. The hand should not have moved at all. Turn the dial to $\overset{RX10}{\Omega}$ and again touch the leads to the two soldered connections. If the meter needle does not move, put the leads on the table and skip to Item 22. If the needle does move, go on to Item 21c. ☐

21c. If the needle did move there is a short circuit and the radio would blow a fuse if you plugged it into the wall. If the needle did move, turn to Item 34, Unit H. ☐

22. Look to the right of two large soldered connections and find the small soldered connection. Look at the curved copper strip that goes from the right hand large soldered connection to the small soldered connection. ☐

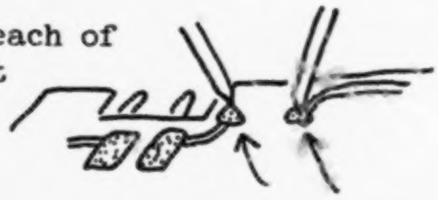


23. Look for another small soldered connection just to the right of the small soldered connection you just located. ☐



24. Set the meter dial at $\overset{RX10}{\Omega}$. Pick up one lead in each hand. ☐

25. Hold one of the meter leads against the top of each of the two small soldered connections that you just located. Keep your hands up in the air so they do not touch the circuit board. ☐



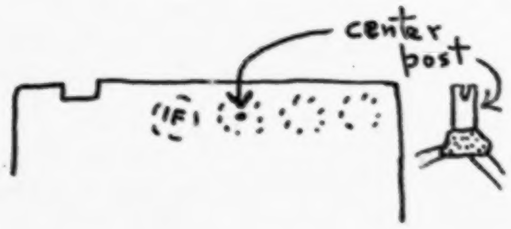
26. Hold the tips of the leads on the soldered connections and read the top, black ohm scale of the meter. The red hand will be between the 0 and the 5. Look closely to determine the reading. Then lay the leads down on the table and write the meter reading here: __________. You should have read approximately 1.5. If you did not read between 1 and 2, go to Unit H, Item 73. ☐

27. Since the dial is set at RX10, you must multiply the reading by 10. Multiply the reading and write the resistance here: ____________ ohms. ☐

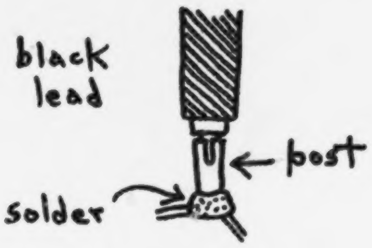
28. The meter reading was approximately 1.5, between 1 and 2. 1.5 x 10 is equal to approximately 15 ohms, between 10 and 20. Hold the circuit board in place and tip the yellow box so that you can see that on the other side of the board from the two connections you just measured is the grey 15 ohm resistor. Then put the yellow box back on the table as before. ☐

29. Now set the meter dial at $\overset{RX1}{K\Omega}$. ☐

30. There are three sockets soldered to the circuit board just to the right of the IF Transformer connections. Look at the connections of the socket just to the right of the IF Transformer. Notice that the center post of the socket is soldered to the circuit board. ☐



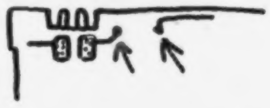
31. Pick up the black lead and put the tip of the lead into the hollow center post of the socket you just looked at, the socket next to the IF Transformer, which is the socket third from the right edge of the board.



○

32. Let go of the black lead and leave it inside the center post of the socket. Pick up the red lead in your left hand, and touch the very large copper strip. Scratch the copper strip slightly to make contact and the red hand of the meter will move all the way over to the right. ○

33. Look again at the two soldered connections of the 15 ohm resistors. They are just to the right of the large soldered connections of the two prongs that project from the edge of the board.



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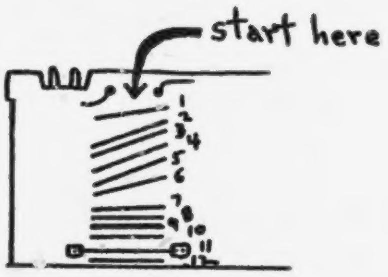
34. Starting at the position on the board between the 15 ohm resistor connections, look at the copper strips running from left to right across the board between the back edge of the board and the edge of the board closest to you. Count the strips, and be sure to include the straight strip at the very bottom edge of the board, just below the 2 soldered connections of the tuner capacitor.



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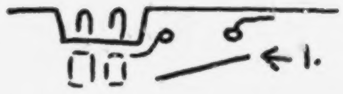
35. You are going to check some of the connections of the radio by touching one of the 12 strips at a time with the red lead. First touch strip number 1, which is closest to the 15 ohm resistor connections. Look at the meter hand. It should not move. If it does move, draw a large question mark beside the circle instead of putting a check in the circle. If it does not move, simply check the circle as usual.



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36. Now touch the red lead to the second strip. The meter hand should not move. If it does move, draw a question mark beside this circle. If it does not move, simply check the circle as usual. ○

37. Watch the meter hand closely as you touch the red lead to the third strip, scratching the strip slightly. The hand should move over to the right and then back to the left. If the hand does not move, draw a question mark beside this circle. ○

38. Watch the meter hand closely and touch the fourth strip. The hand should move to the right slightly, then back toward the left. It might be necessary to scratch the strip lightly. If the hand does not move at all, put a question mark beside this circle. ○

39. Watch the meter hand closely and touch the fifth strip. The hand should move to the right slightly then back toward the left. It might be necessary to scratch the strip slightly to make contact. If the hand does not move at all, put a question mark here. ○

40. Watch the hand of the meter and touch the sixth strip. The hand should not move at all. If the hand does move, draw a question mark here. ○

41. The first six strips you just tested lie at an angle across the board. The seventh strip lies straight across the board. Touch the red lead to the seventh strip. The hand should swing all the way over to the right to 0 on the scale. Scratch the strip slightly if necessary to make contact. If the hand does not move all the way to the right, draw a question mark beside this circle. ○

42. Look closely at the seventh strip and follow it to the right to the large copper strip. Follow the large copper strip up and to the right and see that it is soldered directly to the center post containing the black lead. ○

43. Now touch the eighth strip. The hand should not move. If it does move, put a question mark beside the circle. ○

44. Now touch the ninth strip. The hand should swing all the way to the right because this strip connects to the large wide copper strip that runs all the way to the center post containing the black lead. If the hand does not move, put a question mark beside the circle. ○

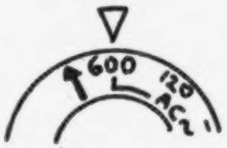
45. Watch the hand and touch the strip third from the edge of the board. The hand should move a bit to the right, and then back to the left. If the hand does not move, draw a question mark beside this circle. ○

46. Now touch the last two strips. The hand should not move. If it does move, put a question mark beside the circle. Lay the red lead on the table. ○

47. Now look back on these pages at all the items from 35 to 46 and see if you have drawn any question marks. Repeat any item that you have questioned. Erase the question mark if the measurement now comes out as it should. If any of the measurements still come out wrong, skip to Item 13, Unit H. If you didn't draw any question marks, go on to the next item. ○

48. Remove the black lead from the center post and put both leads on the table beside the meter. ○

49. Turn the meter dial to the number 600 which is right beside a heavy black arrow.



○

50. Now put the meter and the leads out of your way over on the right side of the table. ○

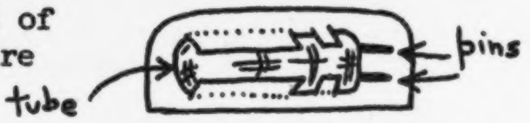
51. Put the yellow box with the circuit board on it over to the right beside the meter. ○

52. Look at the four tube boxes on the Parts Sheet. CAUTION: The four tube boxes contain breakable glass tubes. Handle the tubes and boxes carefully. The box on the far left has 35 W4 printed on the box and on the Parts Sheet. Carefully pick up the 35 W4 box. ○

53. Lay the box gently on the table in front of you and open both ends of the box. Open all three flaps at each end of the box. ☐

54. Hold the box with one hand, and with the other hand reach inside the box and pull out the cardboard enclosure that holds the tube. Carefully lay the cardboard enclosure on the table beside the empty tube box. ☐

55. Look for the metal pins that stick out of one end of the tube. Pull the side of the cardboard enclosure apart at the end opposite the tube pins.

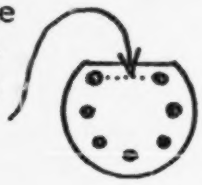


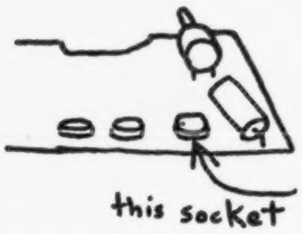
☐

56. From the open end of the cardboard enclosure remove the tube and hold it in your right hand. Discard the empty box and cardboard enclosure. ☐

57. With your left hand pick up the circuit board, turn it over and put it on the table in front of you with the volume control on your right and with the shafts of the tuner capacitor and volume control pointing away from you. ☐

58. The 35 W4 tube you are holding goes into the socket at the right side of the board, next to the white capacitor. Look at the socket and find the gap between two of the holes.





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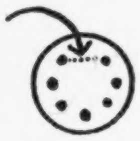
59. Look at the pins on the tube and find the gap between two of the pins. Handle the tube carefully.



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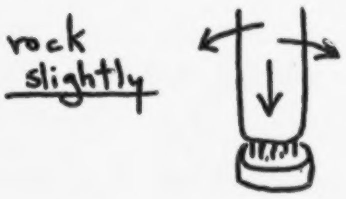
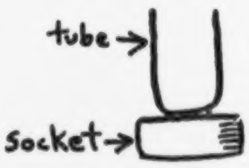
60. Gently insert the pins of the tube part way into the holes in the socket. Be sure each pin goes into a hole, and line up the gap between the pins with the gap between two of the holes. ☐

61. Hold the tube lightly in place with your right hand, and with your left hand hold the circuit board flat against the table. With your right hand hold the tube by the middle, not by its tip, and gently rock the tube slightly from side to side and push it firmly into the socket until the glass tube touches the plastic socket. CAUTION: Don't damage the point on top of the tube. ☐



62. Pick up the circuit board and look closely at the bottom of the tube. If it is not touching the socket, push down firmly on the tube and rock it slightly until it does touch the socket, or until it will move no further. ☐



63. Lay the circuit board gently back down on the table. ☐

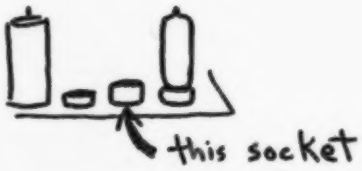
64. Carefully pick up the tube box marked 50 C5. Look at the ends of the box to be sure you have the tube box marked 50 C5. ☐

65. Lay the tube box gently on the table and open all end flaps. ☐

66. Hold the box with one hand and pull out the cardboard enclosure that holds the tube; lay the enclosure gently on the table. ☐

67. Open the enclosure and slide out the tube. Hold the tube carefully in your right hand. Discard the box and enclosure. ☐

68. The 50 C5 tube goes into the socket that is different from the rest, next to the socket holding the 35 W4 tube. Look for the gap between two holes in that socket and look for the gap between two pins of the tube you are holding. Hold the tube carefully. ☐



69. Line up the gap between the pins with the gap between two of the holes. Put the pins of the 50 C5 tube you are holding into the holes of the socket, being sure all pins are lined up with the socket holes. ☐

70. Hold the tube by the middle, not by the tip. Push straight down on the tube as you rock it back and forth until it goes all the way into the socket. CAUTION: Don't damage the point on top of the tube. ☐

71. Pick up the circuit board and look closely at the bottom of the tube to be sure it is just about touching the socket. ☐

72. Lay the circuit board gently on the table. Carefully pick up the third tube box, which says 12 AV6 on it. Be sure the box says AV, not AU. Read again and be sure you have the 12 AV6 tube box, and put the box on the table in front of you. ☐

73. Open both ends of the box, remove the cardboard enclosure carefully and remove the tube. Hold the tube in your right hand and discard the box and the enclosure. ☐

74. Handle the tube carefully. Look at the socket between the IF Transformer and the 50 C5 tube. Find the gap between holes on the socket and find the gap between pins on the tube. ☐

75. Hold the tube in your right hand and line up the 7 tube pins with the 7 socket holes you just looked at. Put the pins into the holes, holding the tube in the middle, not by the tip. Rock the tube slightly back and forth and firmly push the tube into the socket. CAUTION: Don't damage the point on top of the tube. ☐

76. Pick up the board and look to be sure the bottom of the tube just about touches the board. ☐

77. Put the circuit board back on the table. Carefully pick up the last tube box. Read the printing on the end of the box and be sure it says 12 AU6. Put the tube box gently on the table. ☐

78. Open both ends of the box and remove the cardboard enclosure. Remove the tube and hold it in your right hand. Discard the box and cardboard enclosure. ☐

79. This last tube goes into the socket at the far left end of the circuit board. Turn the board so that end of the board is closest to you. ☐

80. Handle the tube carefully. Look at the last empty socket and find the gap between the holes. Look at the tube and find the gap between the pins. ☐

81. Line up the pins of the tube with the holes of the socket and insert the pins into the holes, holding the tube by the middle, not by the tip. Rock the tube slightly and gently back and forth as you push it all the way into the socket. CAUTION: Don't damage the point on top of the tube. ☐

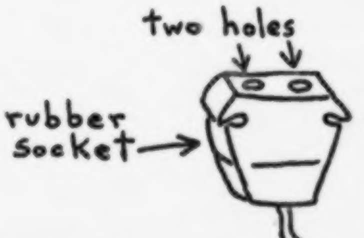
82. Pick up the circuit board and look closely at the bottom of the last tube you just inserted. Be sure the tube just about touches the socket. ☐

83. Put the circuit board back on the table with the volume control on the right. Take the large brown wire cord with the plug on each end out of the yellow box and lay it on the table beside the circuit board. ☐

84. Remove the wire bands from each end of the folded brown wire and discard them. Unfold the brown wire and straighten out the kinks, and lay the wire down on the table again. ☐

85. Near the left end of the circuit board are 2 metal prongs. Look for these 2 prongs, they are near the left corner of the circuit board closest to you. ☐

86. With your right hand take hold of the rubber socket on the one end of the cord and hold it. ☐



87. Hold the circuit board with your left hand; put your left thumb on the front edge of the board near the 2 metal prongs and put the fingers of your left hand on the back edge of the board. With your right hand, put the rubber socket all the way onto the two metal prongs, rocking the rubber socket as you push it on. Lay the circuit board with the wire attached down on the table again. Put the rest of the brown wire behind the yellow box out of your way. ☐

88. Turn the circuit board around so the volume control is on the left. The brown wire and the rubber socket will now be on the edge of the board away from you. Leave the board on the table. ☐

89. Turn the shaft of the volume control to the right until it clicks. ☐

90. Put the yellow box in front of you beside the circuit board. Position the box so the notch in the top edge of one side of the box is on your left. ☐

91. Pick up the circuit board and turn the circuit board over, with volume control on the left and the two shafts pointing away from you. Hold the circuit board carefully in your left hand. ☐

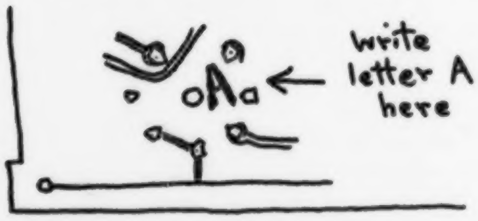
92. Look at the underside of the circuit board and locate the space between the tuner capacitor and the large green wafer capacitor. Put the circuit board on top of the yellow box and put the right side of the box into this space between the tuner capacitor and the green wafer capacitor. ☐

93. Be careful of the tube on the left. Slide the circuit board to the correct position so the white capacitor fits into the notch in the left side of the yellow box. ☐

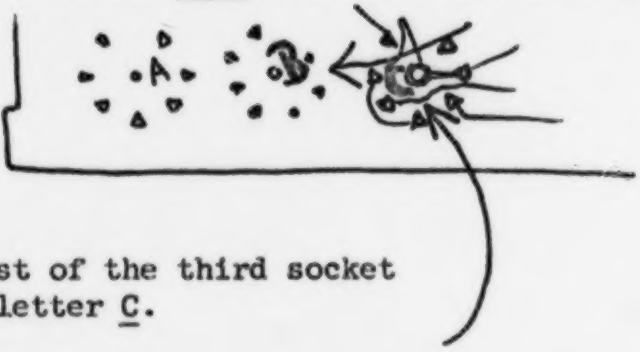
94. Move the yellow box to a position directly in front of you and close to you. ☐

95. If you are not now holding a pencil, get one. (A pen won't do.) ☐

96. Directly on the brown circuit board - not on the copper - beside the center post of the socket in the left hand corner write the letter A. Go over each line of the letter A until the letter is large and black and easy to see. ☐

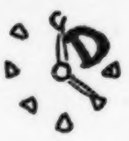


97. Beside the center hole of the next socket, write a large black letter B. ☐

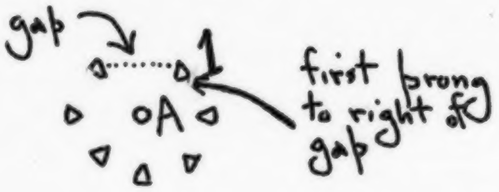


98. Beside the center post of the third socket write a large black letter C. ☐

99. Beside the center post of the socket on the far right, write a large and black letter D.

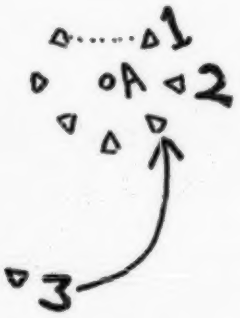


100. Now look closely at socket A on the far left. The first prong to the right of the gap is number 1. Write the number 1 just to the right of prong number 1.



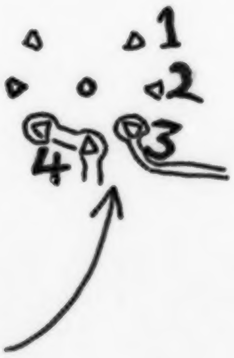
101. The prongs are numbered clockwise, ↷, from the gap. The next prong clockwise next to prong number 1 is prong number 2. Beside prong 2, write the number 2.

102. Just to the right of prong 3, write the number 3.



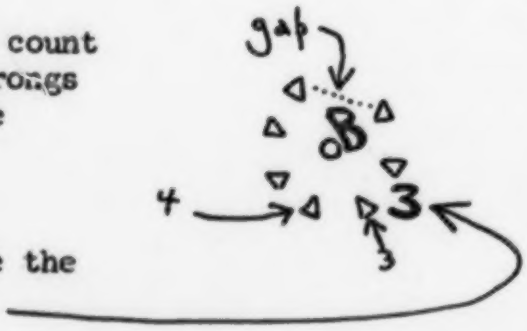
103. Just to the left of prong 4, write the number 4.

104. You need not label the other three prongs. Look again at the socket prongs and compare with this picture to be sure you put the correct number on each prong.

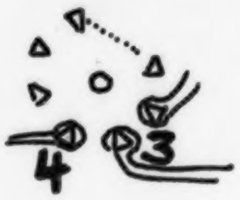


105. Now look at socket B. Start at the gap and count clockwise, ↷, to prong 3. Notice that prongs 3 and 4 are closest to the front edge of the board, closest to you.

106. Just to the right of prong 3 of tube B write the number 3.



107. Just below prong 4 write the number 4.



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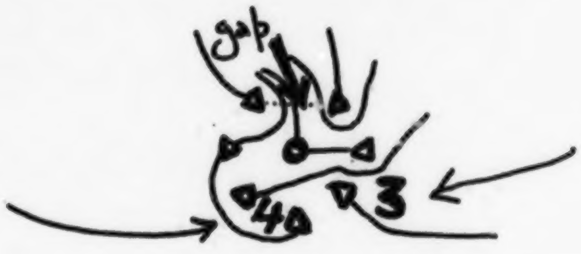
108. Now look at socket C. Start at the gap and count clockwise, ↷, to prong 3. Just to the right of prong 3, write the number 3. Just to the left or prong 4, write the number 4.



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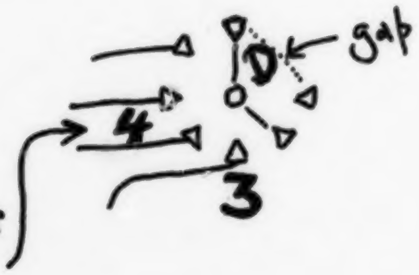
109. Now look at socket D on the far right of the board. Start at the gap and count clockwise to prong 3. Just below prong 3 write the number 3.



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110. Now look at prong 4, which is just to the left of prong 3. Write the number 4 just to the left of prong 4. Put the pencil away.

(_)

111. If you are going to stop now, turn to Page 2 and read the instructions that appear there with the title "Instructions on Putting the Kit Away When You Stop". If you are going to continue on to Unit F immediately, turn the page and begin, after you take a 10 minute rest. (_)

END OF UNIT E

PRECEDING PAGE BLANK-NOT FILMED

READ EACH ITEM COMPLETELY, ALL THE WAY TO THE END OF THAT ITEM, AND THEN DO EVERYTHING THE ITEM TELLS YOU TO DO.

RADIO UNIT F

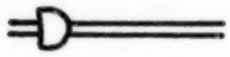
1. If you continued on to this Unit without stopping, go on to the next item, take the Parts Sheet out of the yellow box and arrange all the parts on it, and put the soldering iron and stand over to your right. ☐

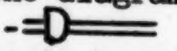
2. Turn to the last couple of pages of this book and find the sheet that says Radio Circuit Diagram. Tear only that one sheet out of the book like this:

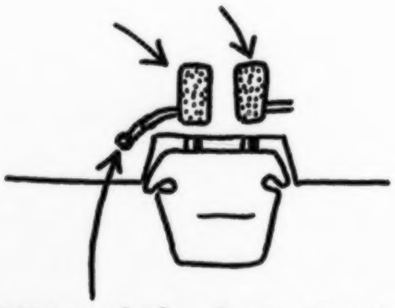
☐

3. Put the yellow box right in front of you and put these instructions to the right of the box. Lay the Radio Circuit Diagram on the table on the left side of the box. Turn it so you can read all the printing on the diagram. ☐

4. A circuit diagram represents the design of the radio by showing which components are connected to which other components. The circuit board was designed to make all the connections that the circuit diagram shows. Locate the drawing of a wall plug near the bottom part of the diagram. ☐



5. You are now going to check some of the circuits on the circuit board and on the diagram. The symbol for the wall plug -  - is the AC source. On the circuit board the large metal prongs with the rubber socket on them is the AC source. Look at the two large soldered connections above the large metal prongs. ☐

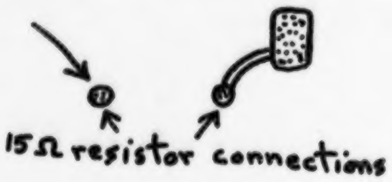


6. Use the point of your pencil to follow the small copper strip from the large soldered connection on the left until you meet a small soldered connection. Look under the board and see what component is soldered to this connection. Write the name of the component here: ____________________. ☐

7. Now look at the Diagram and look at the upper wire from the plug. Follow this wire to the right and you come to the symbol for a _______________. ☐

8. The first component in the filament circuit is the 15Ω resistor. You just located the 15 ohm resistor on both the Diagram and on the circuit board. ☐

9. Now look at the soldered connection at the other end of the 15 ohm resistor on the circuit board.



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10. From the connection you just looked at, follow the copper strip to the left all the way to the edge of the circuit board. Look under the board and see that the connection at the very end of the board is the round white capacitor.

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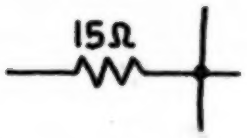
11. Look at the Diagram and find the 15Ω resistor you located a few minutes ago.



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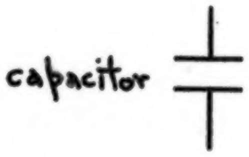
12. From the right end of the resistor the line meets a connection that branches. One branch goes up and meets the symbol for a capacitor. Locate the capacitor symbol close to the 15Ω resistor.



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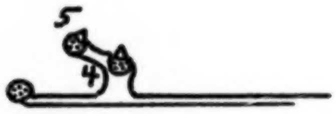
13. The connection to the right of the symbol for the 15Ω resistor branches and one line goes to terminal 5 of Tube A. Find terminal 5 of Tube A on the drawing of Tube A. ☐

14. The copper strip from the 15Ω resistor connects to terminal 5 of Tube A. Now find prong 5 of Tube A on the circuit board. ☐

15. When you looked for prong 5 of Tube A you noticed that the copper strip also connected with prong 4. Look again at the circuit board and see that the copper strip from the 15 ohm resistor connects with the round white capacitor in the corner of the board, and also with prongs 4 and 5 of Tube A.



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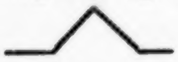
16. Look at the Diagram again. The connection just to the right of the 15 ohm resistor also sends a line down to the four filament symbols. The filament is the part of the tube that lights up when the radio is turned on. Locate the four filament symbols.



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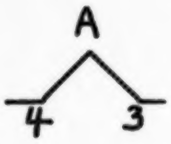
17. The first filament on the left has the letter A above it which means it is the filament of Tube A. Look and see that the line meets the filament of Tube A and is labeled number 4, meaning prong 4. ☐

18. The other end of the filament of Tube A is connected to prong 3 of Tube A. Find the number 3 at the other end of the filament.



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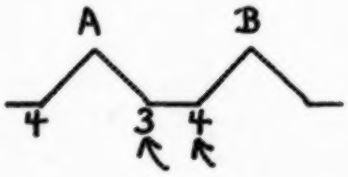
19. Prong 3 of Tube A is connected to prong 4 of Tube B. Look closely at the diagram and see that prong 3 of Tube A is connected to prong 4 of Tube B.



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20. Now look at the circuit board. Find prong 4 of Tube A. Inside the tube this prong connects to the filament. The other end of the filament connects to prong 3. Locate prong 3. ☐

21. Look at the copper strip from prong 3 of Tube A and follow it over to prong 4 of Tube B. ☐

22. Inside Tube B, prongs 3 and 4 are connected to the filament. Now locate prong 3 of Tube B. ☐

23. With your pencil, follow the copper strip from prong 3 of Tube B over to the right until it makes a connection. What prong does it connect with? Write it here: prong __________ of Tube _________. ☐

24. The copper strip went all the way over to prong 3 of Tube D. Look at the Circuit Diagram and find the filament connection from Tube B to Tube D. ☐

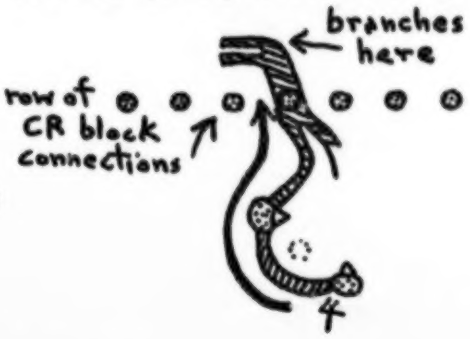
25. The filament of Tube D is then connected to prong 4 of Tube D. On the Circuit Diagram look and see that the next connection is with prong 3 of Tube C. ☐

26. Now look at the circuit board. Locate prong 4 of Tube D. ☐

27. With your pencil, follow the copper strip from prong 4 of Tube D to its next connection. Write the next connection here: prong _________ of Tube ______. ☐

28. One end of the Tube C filament connects to prong 3 of Tube C. The other end of the filament in Tube C is connected to prong 4. Locate prong 4 of Tube C on the circuit board. ☐

29. Follow the copper strip from prong 4 of Tube C. It goes past prong 6 and over past one of the wires of the CR 150 block and then it branches. Locate the place where the copper strip branches just beyond the CR 150 connections.



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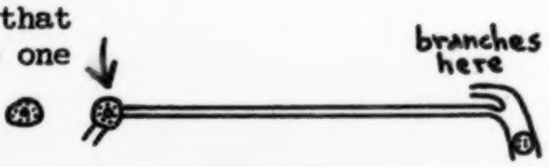
30. The two branches then both go to connections of the volume control. Look at the copper strip that goes straight to the left edge of the board to one of the connections of the volume control.



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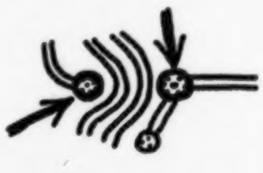
31. Just to the left of the volume control connection you just located is another volume control connection. These connections connect with the off-on switch inside the volume control. Look at both of the connections of the volume control.



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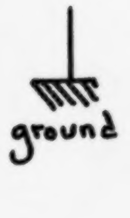
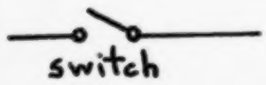
32. Now look at the Circuit Diagram again. Find prong 4 of Tube C filament. ☐

33. Follow the line to the right to a connection. Follow the line down toward the bottom of the Diagram. It connects with ground and also goes way over to the left to the switch. Locate the switch on the Diagram.





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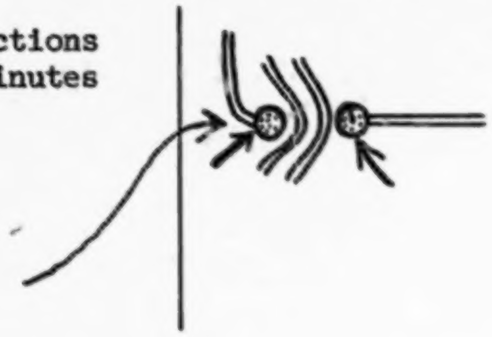
34. See that from the switch the line then goes back to the AC source plug. ☐

35. Now look again at the volume control connections of the off-on switch you looked at a few minutes ago. ☐



36. Look at the switch connection on the left closest to the edge of the board. ☐

37. With your pencil, follow the copper strip from the connection you just looked at and see that it goes up and then along the edge of the board and all the way around to the large soldered connection above the rubber socket prong. ☐

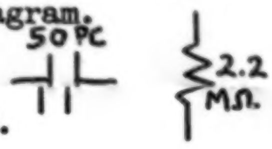
38. You have now followed the entire filament circuit. Now with your pencil, on the Circuit Diagram draw a path showing the filament circuit you just followed. Start with one wire from the plug and go all the way around to the other wire of the plug. On the Diagram, not on the circuit board. ☐

39. Now look at Tube D in the upper left hand corner of the Diagram. ☐

40. Look at the numbers around Tube D. Find 1, 2, 5, 6 and 7. ☐

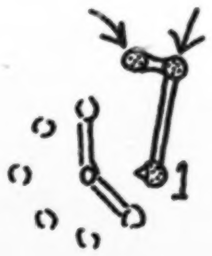
41. The numbers 1, 2, 5, 6 and 7 represent prongs 1, 2, 5, 6 and 7 of Tube D. Look at the filament circuit again and see that prongs 3 and 4 of Tube D are connected to the filament. ☐

42. Prong 1 of Tube D is connected first to a resistor and to a capacitor. Find prong 1 of Tube D and find the capacitor and resistor on the Diagram. ☐



43. Now look at the circuit board at Tube D. Find prong 1 of Tube D. ☐

44. Follow the copper strip from prong 1 of Tube D to the nearest connection, and then to another connection. ☐



45. Look under the edge of the board and see that the two connections you just looked at connect with a green wafer capacitor and with a resistor. ☐

46. Prong 2 of Tube D connects with the center post and then with prong 7. Look at the circuit board and see that prong 2 is connected with prong 7 past the center post. ☐

47. Follow the copper strip from prong 7 all the way to the corner of the board to a connection in the corner. ☐

48. Look under the circuit board and see that this connection is a resistor. ☐

49. Look at the resistor again and see that the other end of the resistor is the same connection you looked at a few minutes ago, which goes to prong 1. ☐

50. Now look at the Diagram. Find the connection where prong 7 and prong 2 are connected. ☐

51. Follow the line down from that connection to the next connection, and follow the line that goes to the left and follow it to the resistor symbol. ☐

52. Follow the line from the other end of the resistor symbol and find the connection with prong 1. ☐

53. You just traced the same paths on both the Diagram and on the circuit board. Now look on the Diagram again at prong 2 of Tube D. ☐

54. Look at the connection of prong 2 with prong 7. Now follow the line straight down past the connection that goes to the resistor and see that prong 2 also connects with one of the coils in the oscillator coil. ☐

55. Look at the circuit board again at prong 7 of Tube D. See that prongs 7 and 2 are connected at the center post. ☐

56. Follow the copper strip from prong 7 up to the resistor connection in the corner. ☐

57. The copper strip that connects with the resistor also connects to another soldered connection. Look under the board and see that this is one of the connections of the oscillator coil. ☐

58. The connection with the oscillator coil is the same as the connection you saw on the Circuit Diagram a few minutes ago. Now look at prong 6 of Tube D on the circuit board. ☐

59. Follow the copper strip from prong 6 of Tube D over to one of the connections of the IF Transformer. ☐

60. Look at prong 5 of Tube D and follow it over until it also connects with the IF Transformer. ☐

61. Now look at the Diagram. Find prong 5, which is the plate. Follow the line until it meets the IF Transformer. ☐

☐

62. Now find prong 6 of Tube D on the Diagram. Follow the line until it connects with another part of the IF Transformer, just as it did on the circuit board. ☐

63. You have checked some of the connections on the circuit board by comparing them with the Circuit Diagram. Now you will check out some connections using the meter. Get the meter and its leads and lay the meter on top of the Circuit Diagram and lay the leads on the table. ☐

64. If the leads are not plugged into the meter, plug the short end of the red lead into the hole marked +, and the short end of the black lead into the hole marked -. ☐

65. Lay the other ends of the two leads on the table beside the meter. ☐

66. You are now going to check the condition of the four tubes. Turn the meter dial and set the dial at $\overset{RX10}{\Omega}$. Look carefully at the dial and be sure it is set at $\overset{RX10}{\Omega}$, not $\overset{RX1}{K\Omega}$. ☐

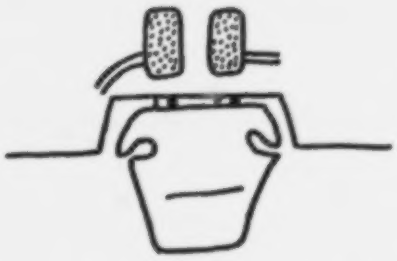
67. Every tube has a filament which is what makes a tube light up. Each filament has resistance to electric current, and gets very hot when current flows through it. Resistance is measured in ohms on the top, black scale of the meter. Locate the black line at the top of the meter, and find the word OHM at the right end of the black line. ☐

68. Pick up both leads, touch the bare metal tips together and hold them together with your right hand. ☐

69. Look at the meter dial. The red hand swung all the way to the right. With your left hand move the small black knob in the lower right hand corner of the meter back and forth until the red hand points exactly at 0 at the right end of the ohm scale. ☐

70. Lay the leads down on the table again. ☐

71. You traced the filament circuit before, all the way from the socket prongs, to each of the four sockets and back to the socket prongs. First look at the two large soldered connections above the two prongs. ☐

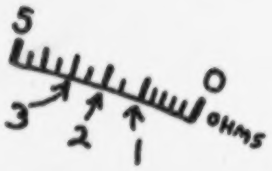


72. Now look at the left connection of the two you just looked at. Follow the copper strip from that connection over to the 15Ω resistor and from the other connection of the 15Ω resistor over to prong 4 of Tube A. ☐

73. Look closely at socket A, in the lower left hand corner of the circuit board. Locate prongs 3 and 4. These two prongs are connected to the filament of Tube A. Look closely and be sure you have located prongs 3 and 4. ☐

74. Pick up one lead in each hand. Look at prongs 3 and 4 of socket A. ☐

75. Touch one lead to the solder connection on prong 3 and one lead to the solder connection of prong 4 of socket A. Read the meter carefully; the red hand is between 0 and 5. Remember that the 4 longer lines between 0 and 5 means 1, 2, 3 and 4. ☐



76. Put down the leads and write down the scale reading you just read, here: ______. Multiply the scale reading by 10 and the resistance of Tube A filament is approximately how many ohms? Write it here.

Tube A - filament: ________ ohms. ☐

77. You should have read approximately 3.5, which means a resistance of about 35 ohms. If you did not get a reading between 3 and 4, go to Unit H, Item 73. ☐

78. Now pick up one lead in each hand and put one lead on prong 3 of socket B and the other lead on prong 4 of socket B and read the meter. Look to see that you have the leads against prongs 3 and 4. The meter hand will be close to number 5. Lay the leads down on the table. ☐

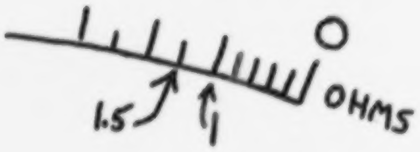
79. Write the dial reading here: ________. Multiply by 10 and the resistance is approximately between 48 or 55 ohms. Write the resistance that you measured here:

Tube B - filament: ________ ohms. ☐

80. If you did not write between 48 and 55 in Item 79, go on to Unit H, Item 73. ☐

81. Now pick out prongs 3 and 4 of socket C. Pick up the leads and touch one lead to prong 3 and one lead to prong 4. Read the meter, then lay the leads on the table. ☐

82. Write the dial reading here: ____________. The meter hand should be approximately halfway between 1 and 1.5 or about 1.3. If you did not read the meter to be approximately 1.2 or 1.3, remeasure. ☐



83. If you did not read between 1 and 1.5, go to Unit H, Item 73. ☐

84. The scale reading should be approximately 1.3. Multiply the reading by 10 and write the resistance here:

Tube C - filament: ________ ohms. ☐

85. Now find prongs 3 and 4 of socket D. Pick up the leads, touch one lead to prong 3 and one lead to prong 4 of socket D, and measure the resistance of the filament of Tube D. Then lay the leads on the table, multiply the dial reading by 10 and write the resistance here:

Tube D - filament: ________ ohms. ☐

86. The resistance of the filament of Tube D should be approximately 1.3 x 10, or 13 ohms; approximately the same as Tube C. If you got a reading for Tube D that is not approximately 1.2 or 1.3, remeasure. ☐

87. If you did not get a measure between 1 and 1.5, go to Unit H, Item 73. ☐

88. Now write all the tube resistances here: (from Items 76, 79, 84, and 85).

(Item 76) Tube A - filament: __________ ohms.
(Item 79) Tube B - filament: __________ ohms.
(Item 84) Tube C - filament: __________ ohms.
(Item 85) Tube D - filament: __________ ohms. ☐

89. These filaments are connected one after another in such a way that their total resistance is simply the sum of the four resistances. Add up the four resistances listed in Item 88 and write the total here:

Total resistance, four filaments: ______________ ohms. ☐

90. The total resistance of the four filaments is approximately 110 ohms - between 105 and 115 ohms. If this is not your answer to Item 89, recheck your addition in Item 89. If you are approximately correct, go on to Item 91. If you are not approximately correct, go on to Item 90a. ☐

90a. Look at Item 88 and compare your numbers with these numbers:

Filament A: approximately 35 ohms (between 34-37 ohms is all right) ☐
Filament B: approximately 50 ohms (between 48-53 ohms is all right) ☐
Filament C: approximately 13 ohms (between 12-14 ohms is all right) ☐
Filament D: approximately 13 ohms (between 12-14 ohms is all right) ☐

If any of your numbers disagree with these, go back and measure again any tube that has been measured incorrectly measuring always prongs 3 and 4. ☐

90b. After your measurements are taken correctly, go on to Item 91. If the measurements still come out wrong, one of the components is defective and must be replaced. ☐

91. The filaments of the four tubes are connected in series, one after another. You can measure the total resistance of the four filaments, which are connected in a series between prong 4 of socket A and prong 4 of socket C. Look at prong 4 of socket A. ☐

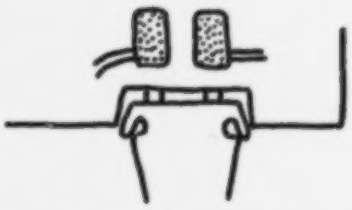
92. Pick up one lead in your left hand and put the tip of the lead against prong 4 of socket A, and hold it there. ☐

93. Pick up the other lead in your right hand and put the tip of the lead against prong 4 of socket C and hold it there. Read the meter. The red hand will be slightly to the left of number 10. Each line between 10 and 20 represents 1, so your reading should be between 10 and 11 or 12. Lay the leads on the table. ☐

94. Write your reading here: ________. Multiply the reading by 10 and write the product here: __________. ☐

95. The resistance you wrote in Item 94 is approximately the same as the total you wrote in Item 89. Compare the number in Item 94 with the number in Item 89 and see that they are approximately equal, within 4 or 5 ohms of being exactly equal. ☐

96. Look at the circuit board at the two large soldered connections above the two prongs that have the rubber socket on them. ☐

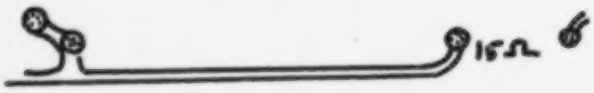


97. Pick up one lead in each hand. Touch one lead to each of the two large soldered connections you just looked at and read the meter, then lay the leads on the table. ☐

98. Write the scale reading here: _________, multiply by 10 to find the total resistance; write it here: _____________ ohms. ☐

99. You should have read the scale to be approximately 12.5, between 11 and 14, which means a resistance of approximately 125 ohms. The total resistance of the 4 filaments was about 110 ohms. Subtract 110 from 125 and write the difference here: ________ ohms. This difference, 15 ohms, is accounted for by the grey 15 ohm resistor. ☐

100. The circuit you just measured was the entire filament circuit, which includes the grey 15 ohm resistor that is next to the large soldered connection you just touched with the leads. Locate prong 4 of socket A and look at the thin copper strip that goes from prong 4 of socket A over to the right to one of the connections of the 15 ohm resistor. ☐



101. The 4 tube filaments, the 15 ohm resistor, and the off-on switch are all connected together, in series. The off-on switch is in the on position now. When you turn the switch off, the circuit is broken and current cannot flow through the filament circuit. Turn the yellow box around so the shafts of the volume control and tuner capacitor points toward you. ☐

102. The off-on switch is in the on position. Without moving the circuit board, take hold of the shaft of the volume control and turn it counter-clockwise, ↶, until it clicks. It is now in the off position. (_)

103. Now turn the yellow box around again so the volume control shaft points away from you. (_)

104. Now pick up both leads and touch them to the large soldered connections above the rubber socket on the two prongs at the edge of the board. Read the meter. (_)

105. The meter hand did not move because when you turned off the volume control you opened the switch and broke the circuit. Lay the leads on the table. (_)

106. Turn the yellow box around again, and turn the volume control clockwise, ↷, until it clicks. It is now in the on position again. Now turn the yellow box around once more so the shafts point away from you. (_)

107. Read these rules carefully, because in a few minutes you will plug in the radio and take some measurements from the circuit board while it is turned on. Read each rule twice. (_)

108. When the radio is plugged in, the radio circuit board is "hot" and the copper strips carry electric current. Do not touch any part of the circuit board or its components while the radio is plugged in. (_)

109. When using the meter to measure voltages while the radio is turned on and plugged in, rest your wrists on the front edge of the yellow box and hold your hands at least 3 or 4 inches away from the copper strips on the circuit board. (_)

110. When measuring voltages while the radio is turned on and plugged in, always be sure to follow directions and set the meter at either AC ∼ volts or DC = volts. Be sure it is not set at $\overset{RX10}{\Omega}$ or $\overset{RX1}{K\Omega}$ or you will blow out the meter. (_)

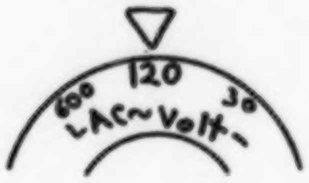
111. Now read all three rules once more. (_)

112. Keeping your hands well away from the circuit board, put the electric cord that is connected to the circuit board around to the back of the yellow box and plug it into the wall socket. If necessary, move to a different table near a wall socket or move this table close enough to a wall socket. (_)

113. After you have put the plug into the wall socket, look at the four tubes. After two or three minutes you will be able to see that all filaments are glowing. CAUTION: Do not touch the circuit board. Look at each tube and see that the parts of filaments that you can see are glowing. (_)

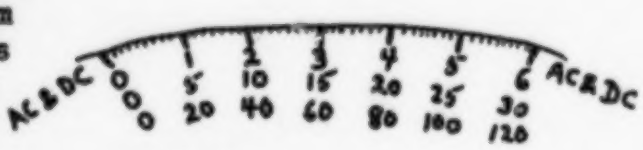
114. The radio might be making slight clicking noises; if it is, don't worry, it is just the tubes warming up. Put the meter and its leads on the table to the left of the yellow box. Do not touch the circuit board. (_)

115. Turn the meter dial to the right, clockwise ↷ , to the AC ∼ Volt range and set it at 120 on the AC ∼ Volt range. CAUTION: AC ∼ Volt, not DC = Volt. ☐

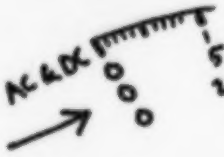


116. Look closely at the meter dial and be sure the dial is set at AC ∼ Volt. ☐

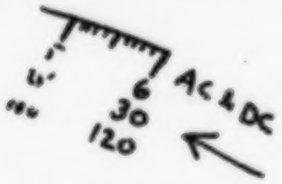
117. Look at the meter scale and locate the black ohm scale at the top. Directly below the black ohm scale is a red scale and below the red scale is another black scale. Look at the left and the right ends of this lower black scale and see that is says in black letters AC & DC. ☐



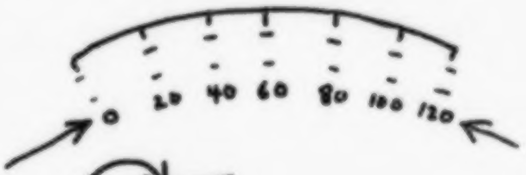
118. This black scale that has AC & DC printed at each end is the voltage scale. Look at the left end of the voltage scale, beneath the left end are three zeroes. Locate the three zeroes on the meter. ☐



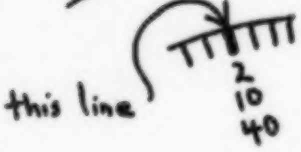
119. At the right end of the voltage scale there are 3 numbers like this: 6
30
120
Locate these numbers on the meter over on the right end of the voltage scale. ☐



120. All the other numbers under the voltage scale are in sets of three. The bottom number of each set of three numbers make up the 0-120 volt scale. Look at all of the bottom row of the voltage scale numbers and see that they are: 0, 20, 40, 60, 80, 100 and 120. ☐

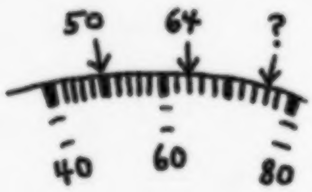


121. The line on the meter directly above 40 on the 0-120 row of numbers means 40 volts. Look at the line on the scale above 40, and notice that it is darker and heavier than the lines near it. ☐



122. The small lines between 40 and 60 each stand for two volts. The first line to the right of 40 is 42, and the first line to the left of 60 is 58. Look for the heavier line between 40 and 60 that stands for 50. ☐

123. Look at the lines on this drawing that represent 50 and 64. Look closely and decide what number the third arrow represents and write the number here: ______________. ☐

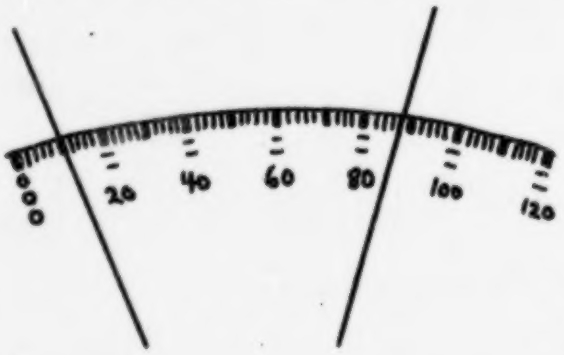


124. The third arrow in Item 123 stands for 76. If you did not write 76, go back to Item 117 and do these items, from 117 to 123 over again, because you must learn to read the meter correctly. ☐

125. Look at this drawing and write the two readings on the 0-120 volt scale here:

__________ A

__________ B



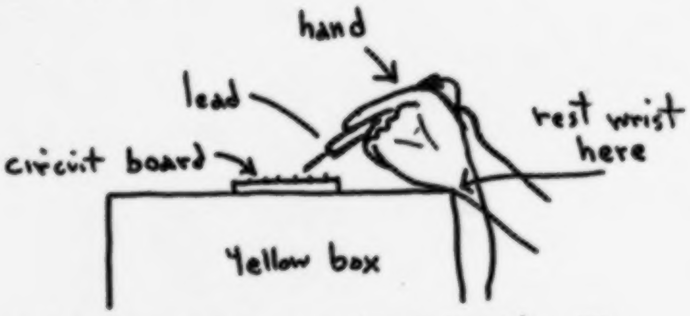
☐

126. The readings on the 0-120 volt scale were 10 and 88. If you did not write these two numbers go back to Item 125 and look more closely at the picture and read the meter correctly. ☐

127. Now look at socket A and locate prongs 3 and 4. ☐

128. Pick up one lead in each hand, keep your fingers on the red or black plastic, do not touch the metal tips.
CAUTION: Keep your hands away from the circuit board. ☐

129. Rest your hands on the front edge of the yellow box but well away from the circuit board, and touch one lead to prong 3 and one lead to prong 4 of socket A. Read the 0-120 volt scale of the meter, then remove both leads and lay them on the table. ☐



130. Write the scale reading here: ________. If you wrote approximately 34, 35, 36, or 37, skip to Item 131; if you wrote anything else, go on to Item 130a. ☐

130a. If you read the ohm scale by mistake you probably wrote approximately 31 or 32; if so, look at the meter scale and locate the 0-120 scale, the 0 is on the left, the 120 on the right. ☐

130b. Now pick up the leads, rest your hands on the front edge of the yellow box well away from the circuit board, and remeasure; read the correct scale. Remove the leads and lay them on the table. ☐

130c. Write the correct number in the block in Item 130. ☐

131. The voltage measured across the filament of Tube A is approximately 35 volts. Write it here:

Tube A - filament: _____ volts. ☐

132. Look at socket B and locate prongs 3 and 4. ( )

133. Pick up one lead in each hand. Look at the meter scale and locate the 0-120 volt scale. ( )

134. Rest your hands on the front edge of the yellow box, keeping them well away from the circuit board. Touch one lead against prong 3 of socket B and one lead against prong 4 of socket B. Read the meter on the 0-120 volt scale. Remove the leads from the prongs; put the leads on the table. ( )

135. Write the meter reading here: ________. If you wrote approximately 50, between 49 and 55 volts, go on to the next item. If you wrote approximately 18 or 19, you read the ohm scale by mistake. If you wrote 18 or 19, or anything but between 49 to 55, go back to Item 132 and repeat Items 132, 133 and 134. ( )

136. The voltage measured across the filament of Tube B is approximately 50 volts. Write it here:

Tube B - filament: _______ volts. ( )

137. Look at socket C and locate prongs 3 and 4. ( )

138. Pick up one lead in each hand. Look at the meter scale and locate the 0-120 volt scale. ( )

139. Rest your hands on the front edge of the yellow box, well away from the circuit board. Touch one lead against prong 3 of socket C and the other lead against prong 4 of socket C. Read the meter on the 0-120 volt scale. Remove the leads from the prongs; lay the leads on the table. ( )

140. Write the meter reading here: ________. If you wrote approximately 12 or 13 volts, go on to the next item. If you wrote anything else except between 11 and 14, go back to Item 137 and repeat Items 137, 138 and 139. ( )

141. The voltage measured across the filament of Tube C is approximately 13 volts. Write it here:

Tube C - filament: _______ volts. ( )

142. Look at socket D and locate prongs 3 and 4. ( )

143. Pick up one lead in each hand. Look at the meter scale and locate the 0-120 volt scale. ( )

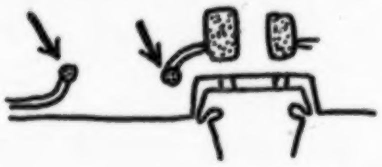
144. Rest your hands on the front edge of the yellow box, well away from the circuit board. Touch one lead against prong 3 of socket D and one lead against prong 4 of socket D. Read the meter on the 0-120 volt scale. Remove the leads from the prongs; lay the leads on the table. ( )

145. Write the meter reading here: ________. If you wrote approximately 12 or 13 volts, go on to the next item. If you wrote anything else than between 11 and 14, go back to Item 142 and repeat Items 142, 143 and 144. ( )

146. The voltage measured across the filament of Tube D is approximately 13 volts. Write it here:

Tube D - filament: ______ volts. ☐

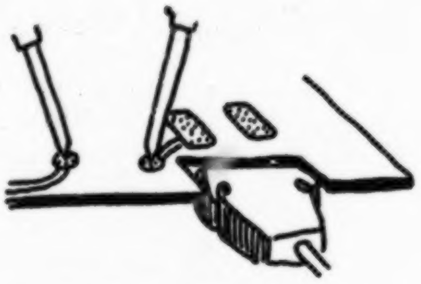
147. Now look at the two small soldered connections of the 15 ohm resistor, just to the left of the rubber socket.



☐

148. Pick up one lead in each hand. Look at the meter scale and locate the 0-120 volts scale. ☐

149. Rest your hands on the front edge of the yellow box, well away from the circuit board. Touch one lead to one of the soldered connections of the 15 ohm resistor and the other lead to the other soldered connection of the 15 ohm resistor. Read the 0-120 volt scale. Remove the leads and put them on the table.



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150. Write the meter reading here: __________. If you wrote approximately 2 or 3 volts, go on to the next item. If you wrote anything else than between 2 and 4, go back to Item 147 and repeat Items 147, 148 and 149. ☐

151. The voltage measured across the 15 ohm resistor is approximately 2 volts. Write it here:

15 ohm resistor: ______ volts. ☐

152. You have now measured the voltage across each of the four tube filaments and the 15 ohm resistor which are all connected in series. Look back at the items indicated and fill in this table:

Item 131 - Tube A, voltage: _________ volts

Item 136 - Tube B, voltage: _________ volts

Item 141 - Tube C, voltage: _________ volts

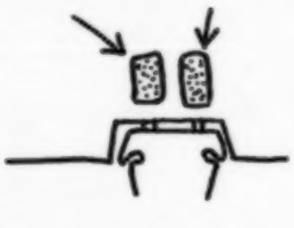
Item 146 - Tube D, voltage: _________ volts

Item 151 - Resistor, voltage: _______ volts ☐

153. Now add up all the voltage measurements from Item 152, and write the total here: ___________ volts. ☐

154. The total of the voltages is approximately 113 volts, that is, 35 + 50 + 13 + 13 + 2 = 113 volts. Check Items 152 and 153 and see that you added all the voltages and wrote approximately 113, between 110 and 118, in the block in Item 153. ☐

155. Now look at the two large soldered connections closest to the rubber socket and above the two large prongs.



☐

156. Pick up one lead in each hand. Look at the meter scale and locate the 0-120 volt scale. ☐

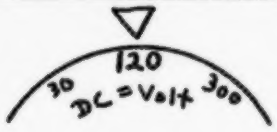
157. Rest your hands on the front edge of the yellow box, keeping your hands away from the circuit board. Touch one lead to each of the large soldered connections you just looked at near the rubber socket. Read the 0-120 volt scale. Remove the leads and put them on the table. ☐

158. Write the meter reading here: ________ volts. If you wrote approximately 110 to 120 volts go on to the next item. If you wrote anything else, go back and repeat Items 155, 156 and 157. ☐

159. The total voltage from the AC source is approximately 115 volts. Look at Item 153 and see that the number is approximately the same as the number you wrote in Item 158. The two numbers you just compared probably do not agree exactly, although they should agree within 4 or 5 volts. Inaccuracies of measurement and voltage fluctuations account for any difference. ☐

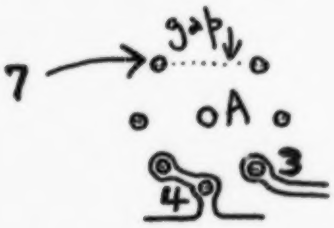
160. Be careful not to touch the circuit board. Remove the plug from the wall socket; this disconnects the radio. ☐

161. Look at the meter dial. The meter dial is set at 0-120 AC ~ Volt. At the bottom of the dial you can see, upside down, the printing that says DC = Volt. Turn the dial around to 120 DC = Volt. ☐



162. DC stands for Direct Current, and AC stands for Alternating Current. DC moves only in one direction, while AC alternates, moving first in one direction, and then in the other. Look carefully at the dial and read the dial setting. Be sure it says 120 DC = Volts. ☐

163. The wall plug of the radio provides AC for the radio. Some components in the radio require DC, and Tube A is a special tube that changes AC to DC for some circuits. You are going to check that tube. Find prong 7 of Tube A. ☐



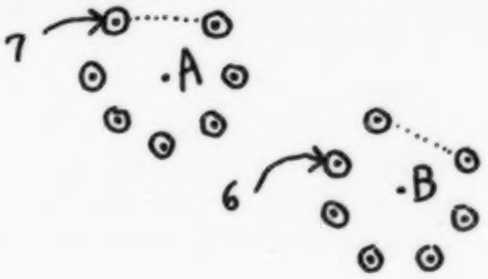
164. Now locate prong 6 of Tube B. DC but not AC can be measured by touching the two prongs you just looked at. First, pick up the red lead in your left hand. ☐

165. Look at the small end of the red lead that is plugged into the meter. It is plugged into the hole marked +. If the red is not in +, and the black in -, change them so that they are -- red +, and black -. ☐

166. CAUTION: Do not touch the circuit board now since you are again going to plug it in. Pick up the plug on the end of the brown wire and plug it into the electrical wall socket. ☐

167. Look again for prong 7 of socket A. ☐

168. Look again for prong 6 of socket B. ☐



169 CAUTION: Keep your hands away from the circuit board. Pick up the black lead in your right hand and rest your hands on the front edge of the yellow box. Touch the red lead to prong 7, Tube A, and the black lead to prong 6, Tube B. Read the meter on the 0-120 volt scale. Then remove the leads and put them on the table. ☐

170. Write the meter reading here: ________ volts. If you wrote approximately 90 volts, between 86 and 95, go on to the next item. If you wrote anything else look at the meter dial and be sure it is set at 120 DC = Volts, then repeat Items 167, 168 and 169 and write the correct meter reading of approximately 90 volts in the box at the beginning of this item. ☐

171. The voltage reading you just took was approximately 90 volts, DC. Now turn the meter dial around again to 120 AC ~ Volts. Look closely at the meter and be sure it is set at 120 on the AC ~ Volts setting. ☐

172. Pick up one lead in each hand, either lead in either hand. Rest your hands on the front edge of the yellow box safely away from the circuit board. Put one lead on prong 7 of Tube A and one lead on prong 6 of Tube B exactly as you just did to measure DC voltage. Look at the meter hand, and see that it doesn't move. Remove the leads and lay them on the table. ☐

173. There is no AC flowing through this circuit on the circuit board, because Tube A will pass DC, but will not pass AC. Now put the meter and the leads aside on another table. ☐

174. Remove the plug from the wall socket. ☐

175. If you are going to stop now, turn to Page 2 and read the instructions that appear there with the title "Instructions on Putting the Kit Away When You Stop". If you are going to continue on to Unit G immediately, turn the page and begin, after you take a 10 minute rest. ☐

END OF UNIT F

READ EACH ITEM COMPLETELY, ALL THE WAY TO THE END OF THAT ITEM, AND THEN DO EVERYTHING THE ITEM TELLS YOU TO DO.

RADIO UNIT G

1. If you put things away and stopped after the last unit, put the Parts Sheet on the table to your left and put the remaining parts on it. Check and be sure that the small square piece of metal is still in the hole in the tuning dial. ☐

2. Be sure the brown wire from the circuit board is not plugged in the electrical wall socket, then remove the rubber plug from the circuit board leaving the circuit board on the yellow box. CAUTION: Be careful as you remove the rubber socket. Do not damage any of the components on the board. ☐

3. Put the brown wire on top of the Parts Sheet so that it is out of your way. ☐

4. You will not use the meter with this unit, but you will use the soldering iron. Put the soldering iron on its stand over to your right where you had it before while using it. ☐

5. Be sure the soldering iron is resting on its stand, then plug in the soldering iron. ☐

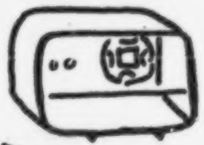
6. Take the circuit board off of the yellow box and put the yellow box beside the radio cabinet. Turn the circuit board over and lay it gently on the table, with the shafts of the volume control and tuner capacitor pointing away from you. ☐

7. Remove each tube and put them gently into the yellow box. Move the tubes slightly from side to side as you pull up on them. Be careful not to damage the tips of the tubes. Remove all four tubes and put them into the yellow box, leaving the box beside the radio cabinet. ☐

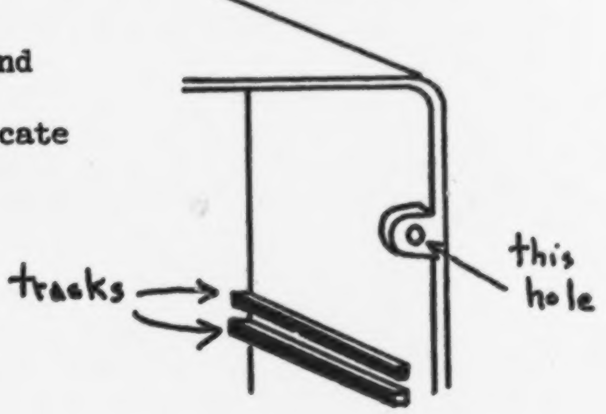
8. Look at the colored wires sticking up in the air. On the left are 2 wires, white and green. Look at the 2 wires on the left and see that one is white and one is green. ☐

9. On the right there are 3 wires: red, blue and black. Look at the 3 wires on the right and see that they are colored red, blue and black. ☐

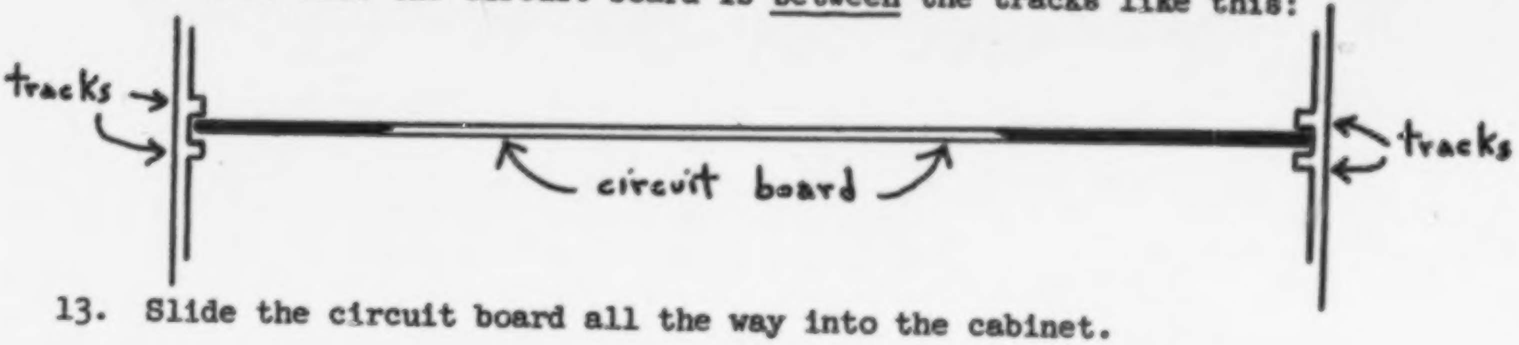
10. Now pick up the radio cabinet and put it on the table beside the circuit board with the open back of the cabinet toward you. ☐



11. Inside the cabinet on each side you will find a screw hole and about one inch below each screw hole a pair of grooves or tracks. Locate the tracks. ☐



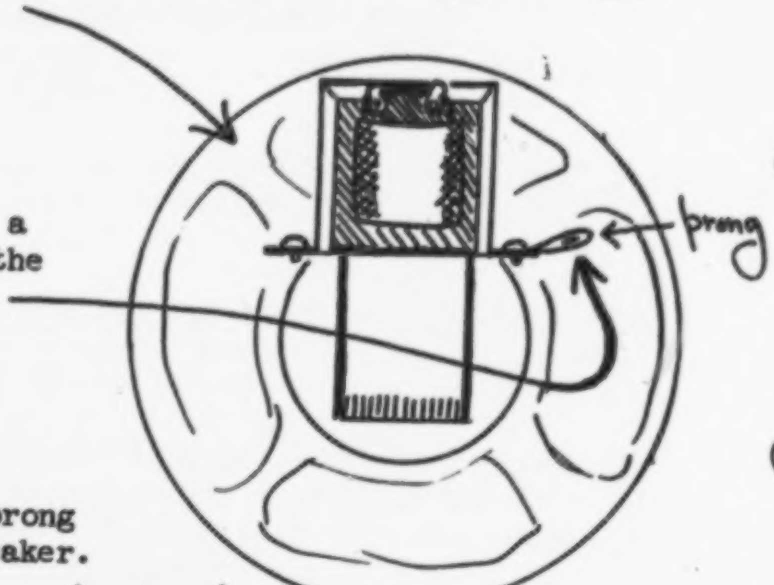
12. Pick up the circuit board with components on top and the shafts pointing away from you. Slide the board into the tracks at each end of the circuit board. Be sure that the circuit board is between the tracks like this: ☐



13. Slide the circuit board all the way into the cabinet. ☐

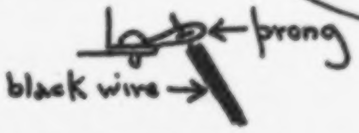
14. Now turn the radio face down with the open back of the radio up in the air. ☐

15. Look inside the radio cabinet at the big metal component on the right. This is the loudspeaker. ☐



16. Look at the back of the speaker and find a prong with a hole in it sticking out to the right. ☐

17. Put the black wire into the hole in the prong you just looked at on the back of the speaker. ☐

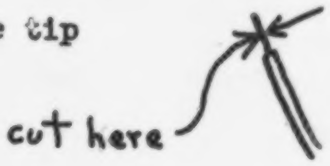


18. Pick up the soldering iron and hold the tip of the iron against the black wire tip and the metal prong. Add one drop of solder. Now add a second drop of solder. When the solder flows onto the wire and the prong, remove the soldering iron and lay it on its holder. ☐

19. Pull gently on the black wire to be sure the wire is soldered firmly to the prong. ☐

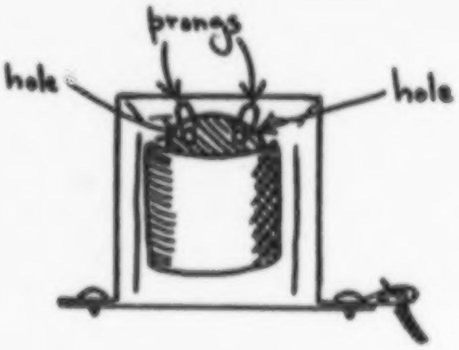
20. Take hold of the blue wire near the tip with one hand, and pick up the wire cutters with your other hand. ☐

21. With the wire cutters, cut off about half of the tip of the blue wire. ☐

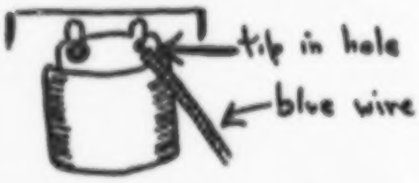


22. Now let go of the blue wire and take hold of the red wire. Cut off half of the tip of the red wire, then let go of the wire and put the wire cutters back on the table. ☐

23. Just above the prong you just soldered is the speaker transformer. Look at the top of the transformer and find the two small metal prongs that appear already to have a drop of solder on them. Look at the hole in each prong. ☐

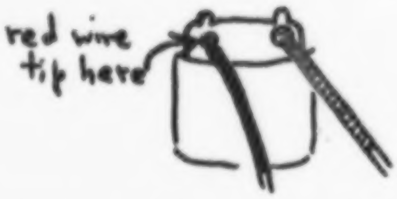


24. Look at the speaker transformer again. Look at the prong on the right at the top of the speaker transformer. Put the tip of the blue wire about half way into the hole in the prong on the right and leave it there. ☐



25. Pick up the soldering iron in one hand and the solder in your other hand. Hold the tip of the soldering iron against the transformer prong and the tip of the blue wire and heat the connection. Then add one or two drops of solder and hold the soldering iron in place until the solder flows onto the wire and the prong. Remove the iron when the solder flows smoothly. ☐

26. Now put the tip of the red wire into the hole in the prong on the left of the top of the speaker transformer. Hold the soldering iron against the tip of the wire and the prong and when the connection heats, add two drops of solder. When the solder flows smoothly onto the connection, remove the iron and lay the soldering iron back on its stand. ☐



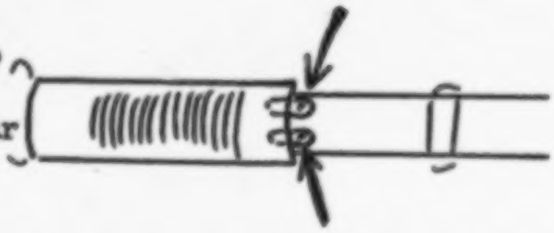
27. Gently tug on both the red and blue wires to be sure they are firmly connected to the speaker transformer. If necessary, resolder. ☐

28. Pick up the soldering iron and the solder. Put the tip of the solder against the soldering iron and let two or three small drops flow onto the tip of the soldering iron. Then put the solder back on the table but continue to hold the iron. ☐

29. Pull the tips of the white and green wires up in the air toward you. Pick up the soldering iron and hold the tip of the iron against the white wire until some solder flows onto the tip of the wire. ☐

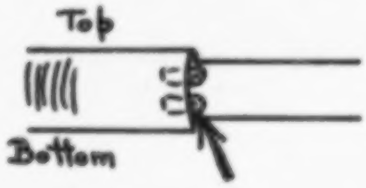
30. Now hold the tip of the iron against the tip of the green wire and let one drop of solder flow onto the tip of the green wire. Let go of the wire and put the soldering iron back on its stand. ☐

31. Look inside the cabinet at the black cylinder to the left of the speaker. This cylinder is the antenna coil. Look at the 2 soldered prongs near the middle of the coil. They might have white paint on them. ☐



32. The white and the green wires are to be soldered to the connections you just looked at. Look again and be sure you see the two connections on the antenna coil. ☐

33. Take the white wire with your left hand and hold the tip of the white wire against the soldered prong closest to the bottom of the radio. ☐



34. Pick up the soldering iron with your right hand and hold it against the tip of the white wire and the soldered prong until the solder flows on both the wire and the prong, then remove the iron but hold the wire in place for a few seconds, then let go of the white wire. ☐

35. With your left hand hold the tip of the green wire against the upper prong of the antenna coil. Hold the tip of the soldering iron against the tip of the green wire and the prong until the solder flows. Remove the iron but hold the wire in place for a few seconds. ☐

36. Put the soldering iron back on its stand. ☐

37. Gently tug on each wire to be sure the connections are firm. If the connections are not firm, add solder to the connection and resolder. ☐

38. Unplug the soldering iron, and put it aside to cool. ☐

39. Slide the circuit board out about half way. ☐

40. Reach into the yellow box and find the tube marked 12AU6, which is one of the shorter tubes. Be sure you have 12AU6, not 12AV6. ☐

41. Put the fingers of your other hand under the circuit board, under the socket on the left for support. This is the socket near the tuner capacitor. Line up the gaps between the holes and the prongs and insert the tube into the socket, rocking the tube as you push it firmly into the socket. ☐

42. Now find tube 12AV6 and put it into the socket beside the IF transformer. Rock the tube gently as you do so, and put your other hand under the socket for support. ☐

43. Now find tube 50C5 and put it into the socket beside the 12AV6 tube, this is the socket which is different from the others. Be sure to put your other hand under the socket for support. ☐

44. Pick up the last tube; be sure it is 35 W4 and put it into the last socket on the right, just as you did with the other tubes. ☐

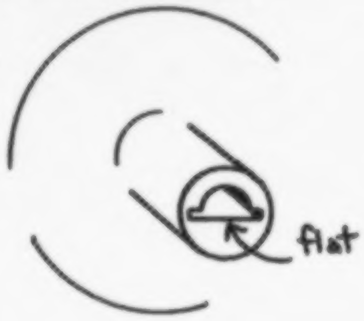
45. Now slide the circuit board carefully into the radio. The tube on the left will bump the screw hole on the inside of the cabinet. Push gently on the circuit board and the tube will lean to the right and slide past the screw hole. Push the circuit board all the way into the radio. ☐

46. Take the brown wire from the Parts Sheet and lay it beside the radio cabinet. ☐

47. Pick up the rubber socket in your right hand and gently plug it about half way onto the two prongs, holding the radio cabinet firmly against the table with your left hand. DO NOT PLUG THE BROWN WIRE INTO THE ELECTRICAL WALL SOCKET. ☐

48. Stand the radio up on its bottom legs and turn the radio so the open back is toward the right, and the front of the cabinet is toward the left. ☐

49. Pick up the large tuning knob from the Parts Sheet. ☐



50. Look at the back of the tuning knob, at the shaft with the opening in it. Notice the opening is flat on one side. Be sure the flat piece of metal is inside the hole. If it is not, find it and slide it back into the flat slot in the tuning knob shaft. ☐

51. Now look at the front of the radio at the tuning shaft; it is the shaft closest to you. Notice that one side of the shaft is also flat. ☐

52. Line up the flat portions of the knob opening and tuner shaft and put the tuning knob part way onto the tuning shaft, just far enough that by turning the knob you can see the metal plates of the tuner capacitor move when you look into the back of the set. Hold the circuit board into the radio so you don't push it out when you push the knob onto the shaft. ☐

53. Let go of the knob and let it remain on the tuner shaft. ☐

54. With your left hand pick up the small black knob from the Parts Sheet and push it part way onto the volume control shaft. Hold the circuit board in place with your right hand as you push the knob onto the volume control shaft. ☐

55. Turn the radio so the front with the knobs on it is facing you. ☐

56. Plug in the radio. CAUTION: Do not touch the circuit board while the radio is plugged in. ☐

57. With your left hand turn the volume control knob all the way to the right, ↷, then all the way back to the left, ↶. Now turn it about half way, 1/2 turn to the right, ↷, and leave it there. Keep your left hand on the volume control knob and wait for the radio to warm up. ☐

58. As soon as the radio hums or makes any noise, take hold of the tuning dial with your right hand and turn it to the right, clockwise ↷, until you find a station between 11 and 16 on the dial. Adjust the volume control with your left hand so the radio is not too loud, but so you can hear the station. ☐

59. As soon as you have tuned in the station clearly, carefully pull the tuning dial off of the tuning shaft without losing the station and put the tuning dial on the Parts Sheet. ☐

60. With your left hand turn the volume down by turning the knob to the left, counter-clockwise ↶, until you can just barely hear the station. ☐

61. Put your right hand against the top and front of the radio and with your left hand pull the volume control knob off of the volume control shaft. ☐

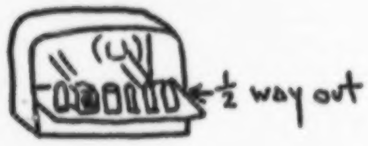
62. Put the volume control knob on the Parts Sheet. ☐

63. Unplug the radio. ☐

64. Turn the radio so the front is away from you and the open back is facing you. ☐

65. Look closely at the tubes and see that they are not still lighted, since you unplugged the radio. They are still very warm; do not touch them. ☐

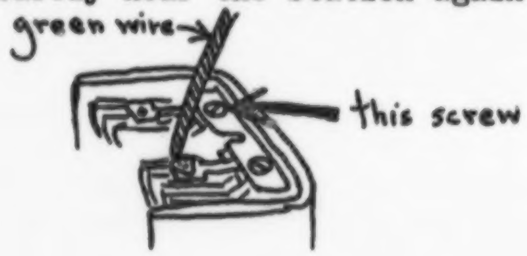
66. Hold the radio case with your left hand, and with your right hand slide the circuit board part way out of the radio until the wires stop it and only about one-half inch of the board is still inside the tracks on the sides of the radio case. Do this gently so the tube on the left leans over and slides over the screw hole on the way past the screw hole. ☐



67. Let go of the circuit board and plug the brown plug into the wall. Be careful not to touch the circuit board. ☐

68. Wait until the radio warms up and you can just barely hear the station again. ☐

69. Look on the top of the tuner capacitor at the screw next to the prong that has the green wire soldered to it. Now locate the other screw on top of the tuner capacitor.



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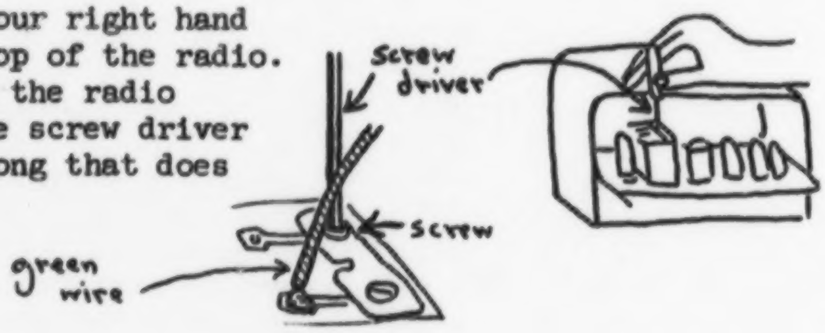
70. Pick up the screw driver in your right hand and rest your right hand on top of the radio. Without touching any parts of the radio components, put the tip of the screw driver into the screw next to the prong that does not have a wire in it. ☐



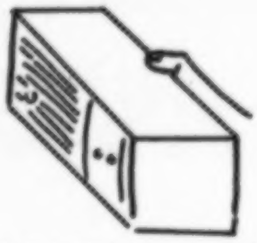
71. Listen carefully to the station you tuned in and turn the screw slowly to the right, clockwise ↷. The station should get a bit louder and then softer. As soon as it begins to get softer, turn the screw backwards until you find the position where the station is as loud as possible. If necessary, turn the screw slightly back and forth to find the position where the station is as loud as the screw will make it. ☐

72. Now take the screw driver away from that screw and lay it down on the table again. ☐

73. Unplug your radio by removing the plug from the electrical wall socket. ☐

74. Push the circuit board all the way into the radio cabinet. ☐

75. Put your right hand around the open back of the radio and pick it up. Put your fingers under the bottom of the radio and your thumb on top.



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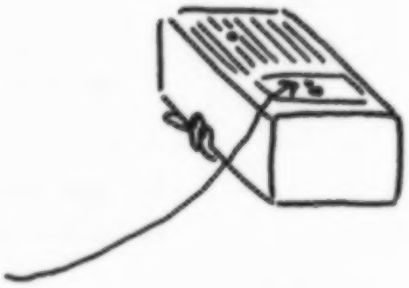
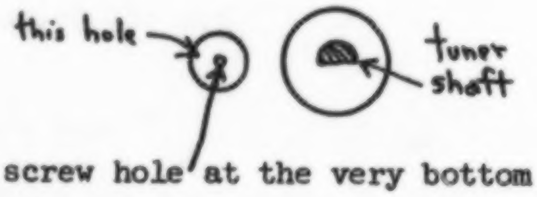
76. Push one finger of your right hand against the circuit board and hold the circuit board all the way into the radio case. Don't touch any of the tubes, they are still very warm. ☐

77. Now turn your right hand over so the radio is lying on your right hand, front up in the air. Continue to hold the circuit board into the radio with one finger of your right hand, but be careful not to touch any of the very warm tubes. ☐



78. Look at the small hole beside the tuner shaft.



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79. Look into the small hole and find the small screw hole at the very bottom of the hole. ☐

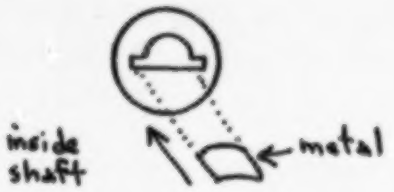
80. With your left hand pick up the small screw from the Parts Sheet. Drop it into the small hole beside the tuner shaft. ☐

81. The tip of the screw must go into that very small screw hole you just looked at, at the bottom of the hole containing the screw. Pick up the screw driver in your left hand, and put the tip of the screw driver into the slot in the screw. Work the screw around until the tip of the screw goes into the very small hole at the bottom of the opening. ☐

82. With your left hand turn the screw driver, whose tip is in the slot in the screw, clockwise, ↷, as many times as necessary until the screw begins to screw down into the small hole. ☐

83. Turn the screw with the screw driver, turning it clockwise ↻, until the screw is tight. Then lay the screw driver aside and lay the radio on the table on its bottom legs, with the front facing you. ☐

84. Pick up the tuning knob. Look inside the hole in the knob and see that a small piece of metal is inside. If it has fallen out onto the Parts Sheet, pick it up and put it back into the tuning shaft.



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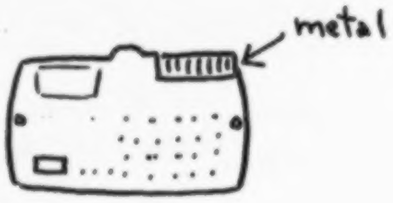
85. Push the tuning shaft all the way onto the tuner shaft. ☐

86. Put the small knob on the volume control shaft. Push it all the way onto the shaft. ☐

87. Pull the rubber socket off of the two prongs, hold the rubber socket in your hand. ☐

88. Pick up the brown back of the radio from the yellow box and hold it so you can read the printing on the back, and so the metal piece of the back is in the upper right hand corner.



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89. In the lower left hand corner is a rectangular opening like this: Put one of the slots in the end of the rubber socket into the left side of this rectangular opening and push the socket into the opening until it fits snugly.

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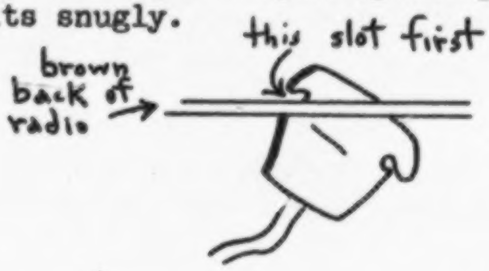
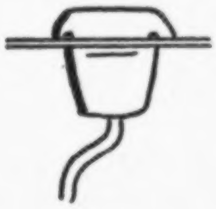
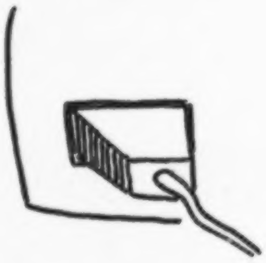
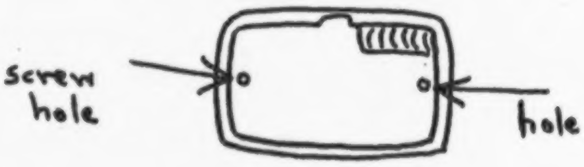






90. Now put the back against the open back of the cabinet so the rubber socket is lined up with its two metal prongs and push the rubber socket onto the metal prongs again. ☐

91. At each side of the back is a small hole. Look into each hole and tilt the back until you can see a yellow screw hole.



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92. Pick up one of the grey knobs marked SEICO from the Parts Sheet and put it into one of the holes you just looked at. Be sure the knob fits into the yellow screw hole. Tighten the knob by turning it clockwise, ↻, until it will not turn any further. ☐

93. Pick up the other grey knob and screw it into the hole at the other side of the back of the radio. Tighten it. ☐

94. Your radio is now finished. Plug it in, turn it on and tune it to a station. ☐

END OF RADIO UNIT G

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RADIO UNIT H

1. If you identified any poorly soldered connections you were told to turn to this Unit, Item 1. Look to see that the soldering iron is resting on its stand as before. Plug the soldering iron into the electrical wall socket. ☐

2. Inspect closely the soldered connections of the volume control on the right end of the circuit board. See that on the volume control connections the solder is smooth and shiny, and has flowed onto each prong and onto each copper ring. ☐

3. Look closely at all of the connections that you soldered and see if there are any other poor connections beside the one you have already identified. ☐

4. Pick up the soldering iron by the handle and look at the tip of the iron. If the tip is fairly clean, silvery and shiny, skip to Item 5. If the tip is discolored or appears to have a coating of discolored material on it, go on to Item 4a. ☐

   4a. Replace the soldering iron on its stand. ☐

   4b. Go get a paper towel, fold it as you did previously into a small pad, and wet it so it is wet through but not dripping water. ☐

   4c. Lay the wet pad on the table between the yellow box and the soldering iron stand. ☐

   4d. Pick up the soldering iron and wipe the tip of the iron on the wet pad to remove the discolored material until the tip is silvery looking. ☐

   4e. Continue to hold the soldering iron. Discard the wet paper pad. ☐

5. Pick up the solder from the table in your other hand. ☐

6. Look at the poor connection you identified. Hold the tip of the iron against the connection, and wait until the solder melts and flows smoothly and shiny. If necessary, add more solder to the connection. ☐

7. Remove the soldering iron but continue to hold it. Look for any other poorly soldered connections and repeat the procedure in Item 6 for every poor connection you find. ☐

8. Replace the soldering iron on its stand, and put the solder back on the table near the Parts Sheet. ☐

9. Once more, inspect all connections and if you find any others that do not look like the connections of the volume control, resolder them following the instructions in Item 6. ☐

10. When all the connections look satisfactory to you, unplug the soldering iron. ☐

11. Move the soldering iron and its stand over to the right side of the table out of your way. ☐

12. Return to wherever you were when you were sent to this unit. ☐

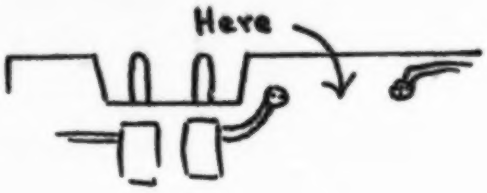
13. You were told to come to this item of this unit because one of the measurements you took was not correct. If the meter hand moved when it should not have moved, skip to Item 34. If the meter hand did not move when it should have moved, go on to the next item, Item 14. ☐

14. Without moving the circuit board, reach into the yellow box, take hold of the volume control shaft and be sure it is turned off. It is off when you turn it to the left, counter-clockwise ↶, until it has clicked. It is on when it is turned all the way to the right, clockwise ↷. When it is off, it will not turn freely back and forth. Leave it off. ☐

15. Turn the volume control knob to the left, counter-clockwise ↶, until it clicks off. ☐

16. Put the tip of the black lead into the center post of socket C, as it was before. ☐

17. Look at the top edge of the circuit, between the two soldered connections to the right of the two metal prongs.



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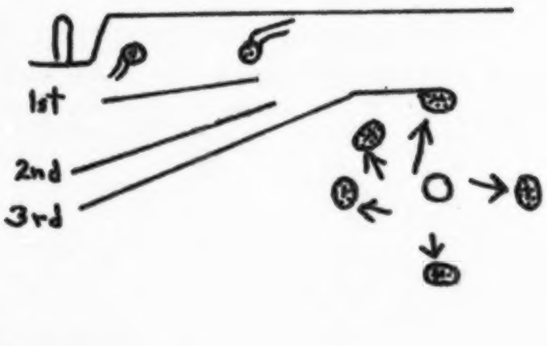
18. Now count down to the third copper strip running across the board. Pick up the red lead and watch the meter hand as you touch this strip with the tip of the lead. The hand should move to the right, then back to the left. If it does not, put an X on this line: ______. Go on to the next item. ☐

19. Now watch the meter hand as you touch the fourth strip with the red lead. The hand should move slightly to the right, then back to the left. If it does not, put an X on this line: ______. Go on to the next item. ☐

20. Now watch the meter hand as you touch the fifth strip with the red lead. The hand should move slightly to the right, then back to the left. If it does not, put an X on this line: ______. Go on to the next item. ☐

21. Look at Items 18, 19 and 20. If you did not put an X on any line, skip to Item 25; if you did put an X on any line, go on to the next item, Item 22. ☐

22. Now look at the third strip again and follow it over to the copper ring around one of the unbent prongs of the IF transformer.



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23. Refer to the drawing in Item 22. In addition to the two large bent prongs on the IF transformer there are 5 soldered prongs in a circle. The prongs are shown in the drawing in Item 22 by small arrows. Locate all 5 unbent prongs of the IF transformer on the circuit board. ☐

24. Examine closely the 5 unbent prongs that you located. At least one of these prongs has been incorrectly soldered. Resolder by going to Item 1 of this unit, Unit H. ☐

25. Count down to copper strip number 10. It is the third strip from the edge of the board nearest you. Pick up the red lead and while looking closely at the meter hand, touch the 10th strip. It should move just a very slight bit to the right, then back to the left. If it does move, skip to Item 31; if it does not move, go on to Item 26. ☐

26. If the meter hand did not move, take the black lead out of the center post of socket C, and put the red lead into the center post of socket C. ☐

27. Count again to strip number 10 - the third from the edge of the circuit board closest to you. Look closely at the meter hand and touch the 10th strip. Then lay the black lead on the table. ☐

28. If the meter hand moved slightly, skip to Item 31, if it did not move go on to Item 29. ☐

29. If the meter hand did not move when you touched the 10th strip, one of the connections of the OSC coil is not properly soldered. Look closely at the connections of the 6 slots of the OSC coil, in the left corner of the circuit board closest to you. Count to see that all six connections are soldered. ☐

30. Put the meter and leads out of your way. You must resolder the connections of the OSC coil. Do this by following the directions that begin at Item 1 of this unit, Unit H. Turn to Item 1 now. ☐

31. Strips 7 and 9 are connected by the wide copper strip directly to the center post of socket C, which contains one of the meter leads. Touch the other lead to strip 7, then strip 9, and watch the meter hand swing all the way to the right. ☐

32. Take the lead out of the center post of socket C and lay both leads on the table. Pick up the meter and leads and put them out of your way. ☐

33. Return to wherever you were when you were sent to this unit. ☐

34. You were told to come to this item if you found a short circuit; thought you might have found a short circuit; or if the meter hand moved when it should not have moved when you took measurements. Move yellow box away from you about a foot or more. ☐

35. The brown wire that is plugged onto the circuit board is not plugged into the electrical wall socket. Look to be sure, and if it is plugged into the wall socket, remove the plug from the wall socket. ☐

36. The soldering iron is on your right, within reach but not in your way. Adjust the position of the soldering iron on its stand so the tip of the iron is not touching either the table or the metal stand. ☐

37. Plug the soldering iron plug into the wall socket. ☐

38. A short circuit, you know, is caused when too much solder has been used and solder has flowed from one connection over onto another copper strip or copper ring. If you know for sure that you have soldered a short circuit and know exactly where it is on the circuit board, skip to Item 63. If you got a wrong measurement, and the meter hand moved when it should not have moved, or if a connection looks like it might be a short circuit but you can't tell if it is or not, go on to Item 39. ☐

39. Without losing your place on this page, turn to the last page of this unit and find the drawing of the circuit board. Tear out the page that has the drawing of the circuit board on it and lay the page on the table beside these instructions. ☐

40. Move these instructions slightly to your left, and put the circuit board slightly to your right so there is room for the yellow box in between the instructions and the drawing. ☐

41. Turn the yellow box if necessary, so the volume control is on the right with both shafts pointing toward you. Move the yellow box with the circuit board on it to a position directly in front of you, and between these instructions and the drawing of the circuit board. ☐

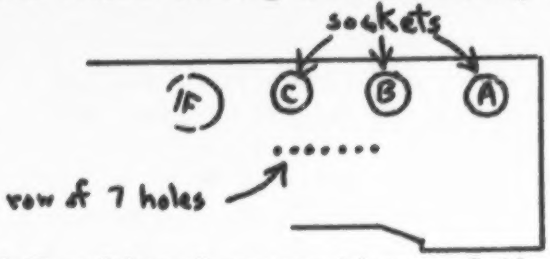
42. The circuit board in the drawing is in the same position as the actual circuit board on the yellow box. Look closely at the circuit board at each soldered connection and look for any place where there is a large blob of solder, that might have flowed across a gap between copper strips. ☐

43. The drawing shows all the connections between copper strips. Look carefully at the circuit board and compare it with the drawings, looking for any place where solder has flowed from one strip to another. ☐

44. If you find a short circuit, remember where it is, and continue to look at all the connections to see if there are any more. ☐

45. As soon as you are sure you found all the short circuits, skip to Item 63. If you have not found any short circuits, but were told to turn to this unit because the meter hand moved when it should not have moved while taking measurements, go on to the next item, Item 46. ☐

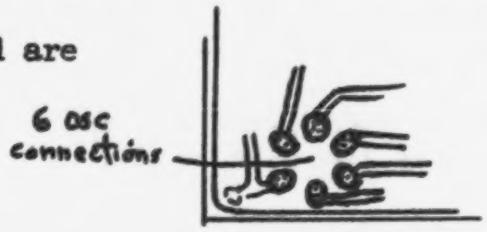
46. There are over 80 soldered connections on the circuit board, you might have soldered a short circuit at any one of them, but you have not been able to find any short circuits yet. Between the row of 3 sockets, socket A, B and C, and the cut-out part of the board is a row of 7 soldered connections of the CR block. Find the row of seven soldered connections. ☐



47. The CR block connections are close together and you might have let solder flow from one connection to another. None of these 7 connections should be soldered to the connection next to it. Look closely at the 7 connections to see if any two have been connected together by a drop of solder. Compare the connections with the drawing. ☐

48. If you find a drop of solder connecting any 2 of the CR block connections together you have found the short circuit. If you have found a short circuit, skip to Item 63; if you did not find a short circuit, go on to the next item, Item 49. ☐

49. In the lower left hand corner of the board are the 6 prong connections of the OSC coil. Locate the OSC coil connections. ☐



50. None of the OSC coil connections should have solder connecting any two of them together. Compare the connections with the drawing of the circuit board and see if solder has made any connections that should not be there. ☐

51. If you have found any short circuit, skip to Item 63. If you have not found a short circuit, go on to the next item. ☐

52. Copper strips pass very close to some of the copper rings that you soldered to the socket prongs. If you soldered in a short circuit, and did not do it at the CR block connections, you might have done so at one of the socket prongs. Locate socket A. ☐

53. Locate socket A on the drawing of the circuit board, and locate prong 7, next to the gap between prongs. Look at the copper strip that comes very close to prong 7. Be sure solder has not flowed from the prong to this strip. If it has, you have located a short circuit, so skip to Item 63; if not, go on to the next item. ☐

54. If you did not find a short circuit at socket A, look next at socket B. Some of the prongs are close to other prongs and to copper strip. Look closely and compare the appearance of each soldered connection with the drawing of the circuit board. Look for any places where solder has made a connection that should not be there. ☐

55. If you found any soldered short circuits on socket B, skip to Item 63. If not, go on to the next item. ☐

56. Look next at socket C on the drawing. Look at each circle representing a copper ring around a socket prong, and look at how close each circle is to many copper strips. ☐

57. Look at the prongs of socket C, one at a time, and compare the connections with the drawing of the circuit board. ☐

58. If you found any short circuits on socket C, skip to Item 63; if not, go on to the next item. ☐

59. Now look at socket D. Look carefully at each soldered connection and compare them with the drawing of the socket D connections. ☐

60. If you found any short circuits, skip to Item 63; if not, go on to the next item. ☐

61. There are many other connections that are close together, or are close to copper strips. Look at the drawing of the circuit board, starting on the left edge and look first at the drawing, then at the circuit board and try to find any place where solder has flowed across the board and made a short circuit between a connection and a copper strip. ☐

62. Continue from left to right looking from the drawing to the circuit board and back to the drawing, looking at one connection at a time. Continue all the way to the right side of the board. ☐

63. Locate every short circuit that you found. Count the number of short circuits and write the number of short circuits here: ________. ☐

64. Pick up the soldering iron and shake off any surplus solder into an ash tray. ☐

65. Look at one of the short circuits that you located. Put the tip of the soldering iron onto the blob of solder that causes the short circuit. When the solder flows onto the soldering iron, remove the soldering iron. ☐

66. Shake the surplus solder into the ash tray. ☐

67. Look at the place on the circuit board where you just removed the short circuit. If there is still excess solder there, touch the tip of the soldering iron to the solder and remove it so the short circuit is completely gone. ☐

68. Lay the soldering iron back on its stand. ☐

69. Look closely at the place on the circuit board where you just removed the short circuit. Compare that place with the drawing of the circuit board. When you are satisfied that that short circuit is removed, put a check mark on this line: ______________________________. ☐

70. Return to Item 64 as many times as necessary and repeat Items 64 through 69 until you have removed all short circuits. You will know when you have removed all short circuits that you have located when the number of check marks in Item 69 is the same as the number you wrote in Item 63. ☐

71. When all short circuits have been removed, unplug the soldering iron. ☐

72. Return to wherever you were when you were sent to this unit. ☐

73. These items tell you how to read the meter correctly, since you apparently have forgotten. Leave the meter on the table and lay the ends of the leads on the table beside the meter. ☐

74. Look at the dial on the meter and locate the top black line. This is the ohm scale, which is used to read measures of resistance. ☐

75. Look at the right end of the ohm scale and find the zero above the end of the line. Always look straight down at the meter. ☐

76. Now locate the number 5 above the ohm scale, about an inch to the left of the zero. ☐

77. Between the 5 and the zero of the ohm scale there are many short lines sticking up. Notice that these vertical lines are of slightly different lengths. ☐

78. The longest of the vertical lines stand for 1, 2, 3 and 4. Find the lines that stand for 1, 2, 3 and 4. There are only four of these lines between zero and 5. ☐

79. Between the 5 and 4 is a single short line, which stands for 4.5, or four and one half. Look for that short line. ☐

80. Now find the short lines that stand for 3.5, 2.5 and 1.5. ☐

81. Between zero and the 1, there are 4 short lines. They stand for .8, .6, .4, and .2. Look at those 4 short lines. ☐

82. Now look above the ohm scale for numbers 5 and 10. ☐

83. Between 5 and 10 there are long lines that stand for 6, 7, 8 and 9. Look at those lines. ☐

84. Between the lines that stand for 5, 6, 7, 8, 9 and 10 there are short lines that stand for 5.5, 6.5, 7.5, 8.5 and 9.5. Look at those short lines. ☐

85. Now look for the numbers 10, 20 and 30. ☐

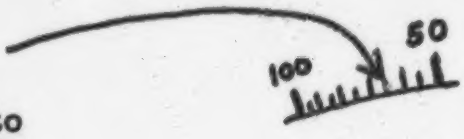
86. There are 9 short lines between 10 and 20 and 9 other short lines between 20 and 30. The lines between 10 and 20 stand for 11, 12, 13, 14, 15 and so on. Look at the lines between 10 and 20, and then at the lines between 20 and 30. ☐

87. Between 30 and 50 the lines stand for 32, 34, 36, 38, 40, 42, 44, 46 and 48. Look at these lines. ☐

88. Between 50 and 100, the longer lines stand for 60, 70, 80 and 90. In between are shorter lines that stand for 55, 65, 75, 85 and 95. Find all these lines. ☐

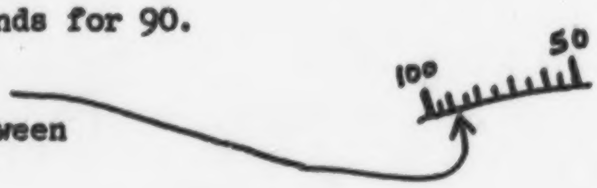
89. Find the line that stands for 65. ☐

90. You should have found this line: It is the third line to the left of 50. If you did not, go back to Item 88 and repeat Items 88 and 89. ☐



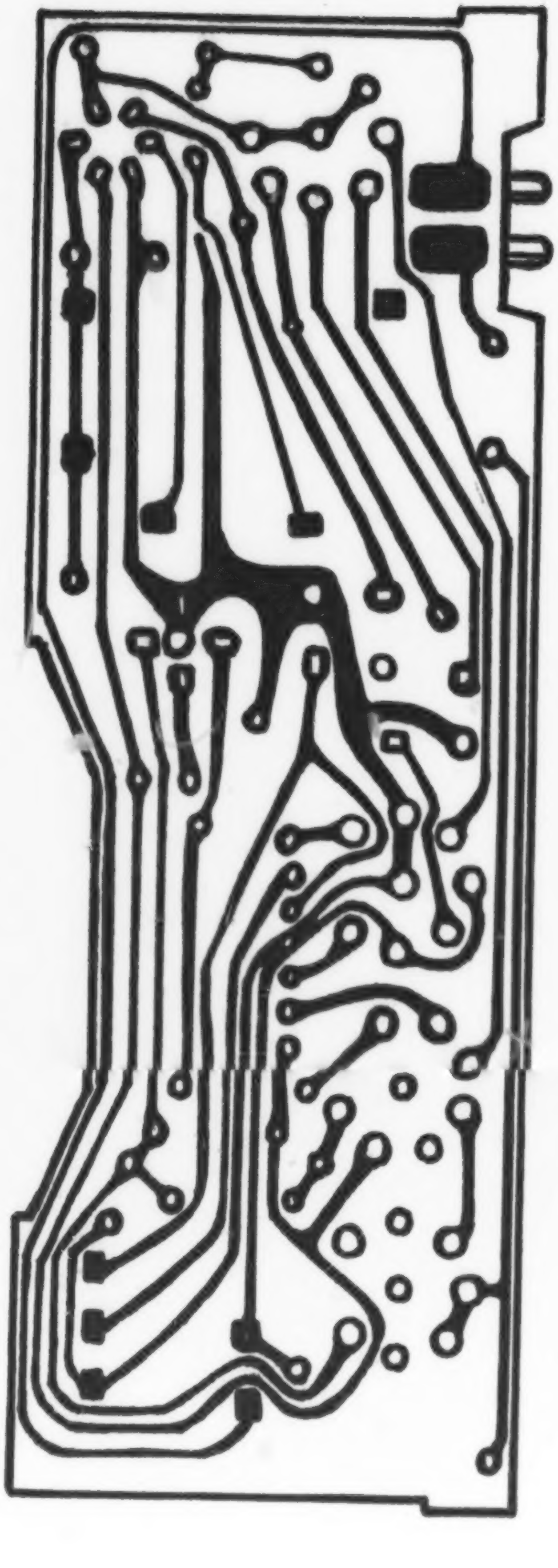
91. Now find the line that stands for 90. ☐

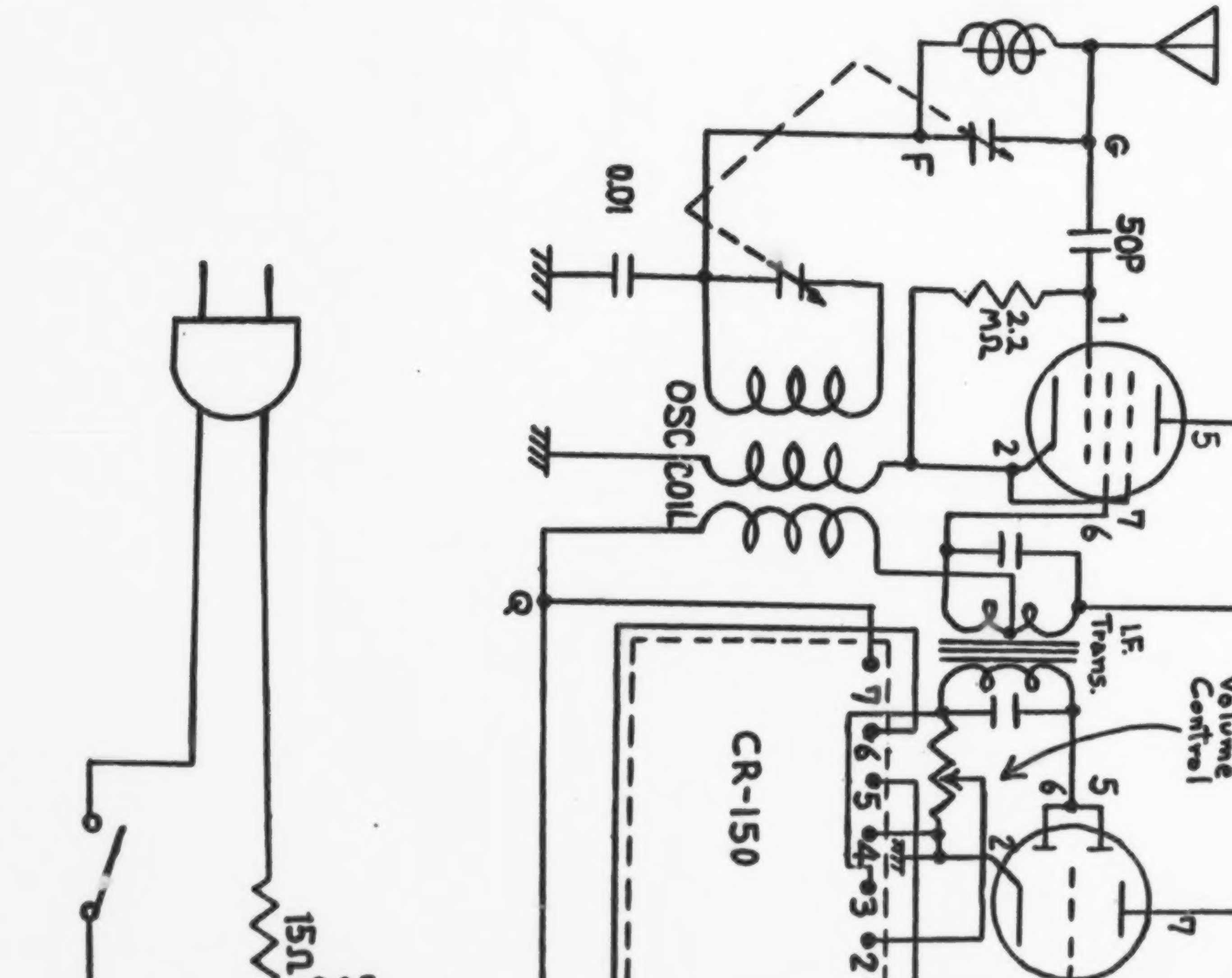
92. This line represents 90: There is only one line between it and 100. ☐



93. Now return to the item that sent you to this unit, and take the measurement over again. If it still comes out wrong, the component is defective and you must get a new one to use in the radio. ☐

END OF RADIO UNIT H





RADIO CIRCUIT DIAGRAM